FCC/IC RF - TEST REPORT

Report Number	:	**68.950.20.0416.01**	Date of Issue:	2020-08-10
Model	:	**RMRU3**		
Product Type	:	The Remote		
Applicant	:	GoPro, Inc.		
Address	:	3025 Clearview Way, San Mateo, CA 94402, USA		
Manufacturer	:	GoPro, Inc.		
Address	:	3025 Clearview Way, San Mateo, CA 94402, USA		
Production Facility	:	WNC (Kunshan) Corporation		
Address	:	88 Central Avenue, Comprehensive Free Trade Zone, Kunshan City, Jiangsu Province, P.R. China		
Test Result	:	■ **Positive** ☐ **Negative**		
Total pages including Appendices	:	47		

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1 Table of Contents

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Shenzhen City, 518052, P. R. China Tel. +86 755 8828 6998, Fax: +86 755 8828 5299

2 Details about the Test Laboratory

Details about the Test Laboratory
Test Site 1

Company name:	TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch Building 12&13, Zhiheng Wisdomland Business Park, Nantou Checkpoint Road 2, Nanshan District, Shenzhen City, 518052, P. R. China
FCC Designation Number:	CN5009
FCC Registration No.:	514049
ISED#:	10320A
Telephone:	86 755 8828 6998
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3 Description of the Equipment under Test

Product:	The Remote
Model no.:	RMRU3
FCC ID:	CNFRMRU3
IC:	10193A-RMRU3
PMN:	RMRU3
HVIN:	RMRU3
Rating:	3.85Vdc, 810mAh supplied by a rechargeable Lithium Ion Battery or 5Vdc/2A supplied by USB type C port.
RF Transmission Frequency:	2402MHz-2480MHz
No. of Operated Channel:	40
Modulation:	GFSK
Antenna Type:	Internal Integrated Metal Antenna
Antenna Gain:	0.64dBi max for 2.4GHz
Description of the EUT:	The Equipment Under Test (EUT) is The Remote supports Bluetooth Low Energy function support data rate 1 Mbps, 2 Mbps.

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4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2019 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators
RSS-Gen Issue 5, Amendment 1, March 2019	General Requirements and Information for the Certification of Radio Apparatus
RSS-247 Issue 2 February 2017	Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSS) and License-Exempt Local Area Network (LE-LAN) Devices

All the test methods were according to KDB 558074 D01 15.247 Meas Guidance v05r02 and ANSI C63.10 (2013).

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5 Summary of Test Results

Technical Requirements			
FCC Part 15 Subpart C/RSS-247 Issue 2/RSS-Gen Issue 5			
Test Condition		Test Result	Test Site
§15.207 RSS-GEN 8.8	Conducted emission AC power port	Pass	Site 1
§15.247 (b) (3) & RSS-247 5.4(d)	Conducted output power	Pass	Site 1
RSS-247 5.4(d)	Equivalent Isotropic Radiated Power	Pass	Site 1
§15.247(e) RSS-247 5.2(b)	Power spectral density	Pass	Site 1
§15.247(a)(2) RSS-247 5.2(a) & RSS-GEN 6.7	6dB bandwidth	Pass	Site 1
§15.247(a)(1) RSS-247 5.1(b)	20dB Occupied bandwidth	N/A	--
RSS-GEN 6.7	99% Occupied Bandwidth	Pass	Site 1
§15.247(a)(1) §RSS-247 5.1(b)	Carrier frequency separation	N/A	--
§15.247(a)(1)(iii) RSS-247 5.1(d)	Number of hopping frequencies	N/A	--
§15.247(a)(1)(iii) RSS-247 5.1(d)	Dwell Time	N/A	--
§15.247(d) RSS-247 5.5	Spurious RF conducted emissions	Pass	Site 1
§15.247(d) RSS-247 5.5	Band edge	Pass	Site 1
§15.247(d) & §15.209 & §15.205 RSS-247 5.5 & RSS-Gen 6.13	Spurious radiated emissions for transmitter	Pass	Site 1
§15.203 RSS-Gen 6.8	Antenna requirement	Pass See note 1	--

Remark 1: N/A – Not Applicable.
Note 1: The EUT uses an Integrated antenna, which gain is 0.64dBi. In accordance to §15.203 and RSS-Gen 6.8, it is considered sufficiently to comply with the provisions of this section.

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6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: CNFRMRU3, complies with Section 15.207, 15.209, 15.205, 15.247 of the FCC Part 15, Subpart C

This submittal(s) (test report) is intended for IC: 10193A-RMRU3, complies with RSS-247, RSS-GEN.

The Model: RMRU3 supports Bluetooth Low Energy, power by 3.85Vdc, 810mAh supplied by a rechargeable Lithium Ion Battery or 5Vdc/2A supplied by USB type C port.

The TX and RX range is 2402MHz-2480MHz.

This report is for the Bluetooth Low Energy.

SUMMARY:

All tests according to the regulations cited on page 5 were

■ - Performed

☐ - **Not** Performed

The Equipment under Test

■ - **Fulfills** the general approval requirements.

☐ - **Does not** fulfill the general approval requirements.

Sample Received Date:	2020-08-03
Testing Start Date:	2020-08-03
Testing End Date:	2020-08-10

- TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch -

Reviewed by:	Prepared by:	Tested by:
John Zhi	Joe Gu	Tree Zhan
Project Manager	Project Engineer	Test Engineer

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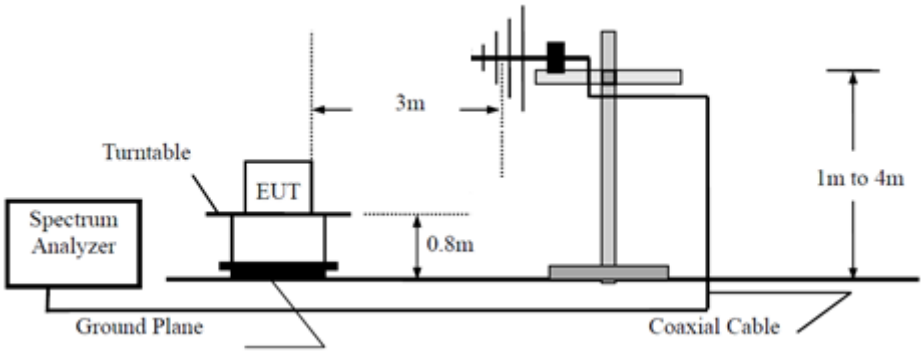
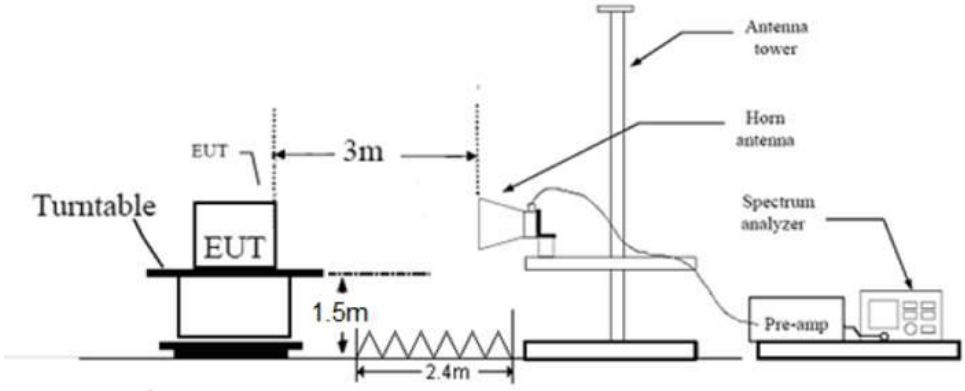
7 Test Setups

7.1 Radiated test setups

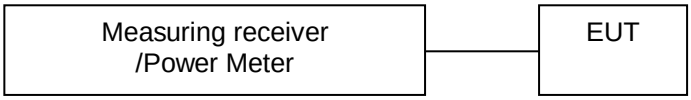
Below 1GHz



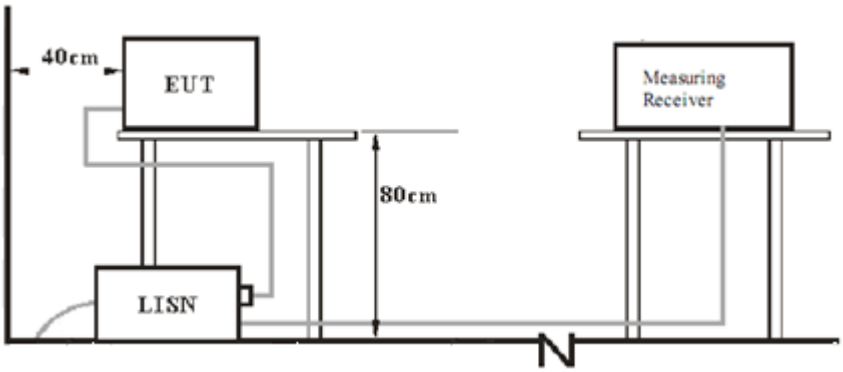
Above 1GHz



7.2 Conducted RF test setups



7.3 AC Power Line Conducted Emission test setups



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8 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.	S/N
Laptop	Lenovo	X240	---
USB Type C cable	GoPro	0.46m (Length)	---
AC Adapter	GoPro	AWALC-002	---

Test software information:

Test Software Version	STM32CubeMonitor-RF(V2.5.0)	
Modulation	Setting TX Power	Packet Type
GFSK	31(+6dBm)	Pseudo-Random bit sequence 9

The system was configured to channel 0, 19, and 39 for the test.

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9 Technical Requirement

9.1

9.1 Conducted Emission

Test Method

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. Both sides of AC line were checked for maximum conducted interference.
6. The frequency range from 150 kHz to 30 MHz was searched.
7. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

Limit

According to §15.207 & RSS-GEN 8.8, conducted emissions limit as below:

Frequency MHz	QP Limit dBµV	AV Limit dBµV
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

*Decreasing linearly with logarithm of the frequency

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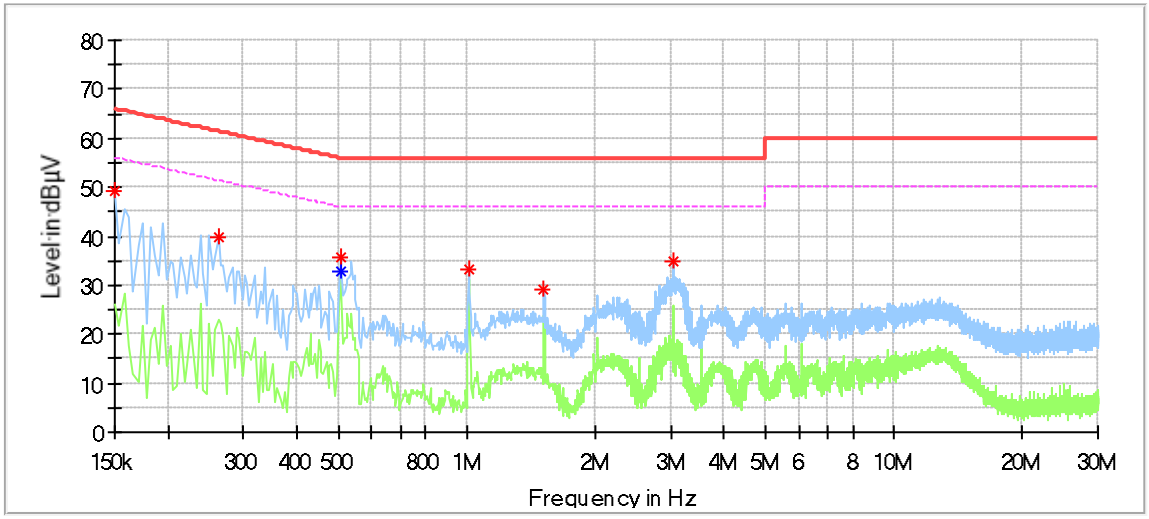
Conducted Emission

Product Type : The Remote
M/N : RMRU3
Operating Condition : Charging + Transmit
Test Specification : Power Line, Live
Comment : AC 120V/60Hz (External adapter)



Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.150000	49.09	---	66.00	16.91	L1	9.6
0.262000	39.95	---	61.37	21.42	L1	9.5
0.506000	35.78	---	56.00	20.22	L1	9.6
0.506000	---	32.62	46.00	13.38	L1	9.6
1.014000	33.38	---	56.00	22.62	L1	9.6
1.518000	29.07	---	56.00	26.93	L1	9.6
3.038000	35.00	---	56.00	21.00	L1	9.6

Remark：
Level=Reading Level + Correction Factor
Correction Factor=Cable Loss + LISN Factor
(The Reading Level is recorded by software which is not shown in the sheet)

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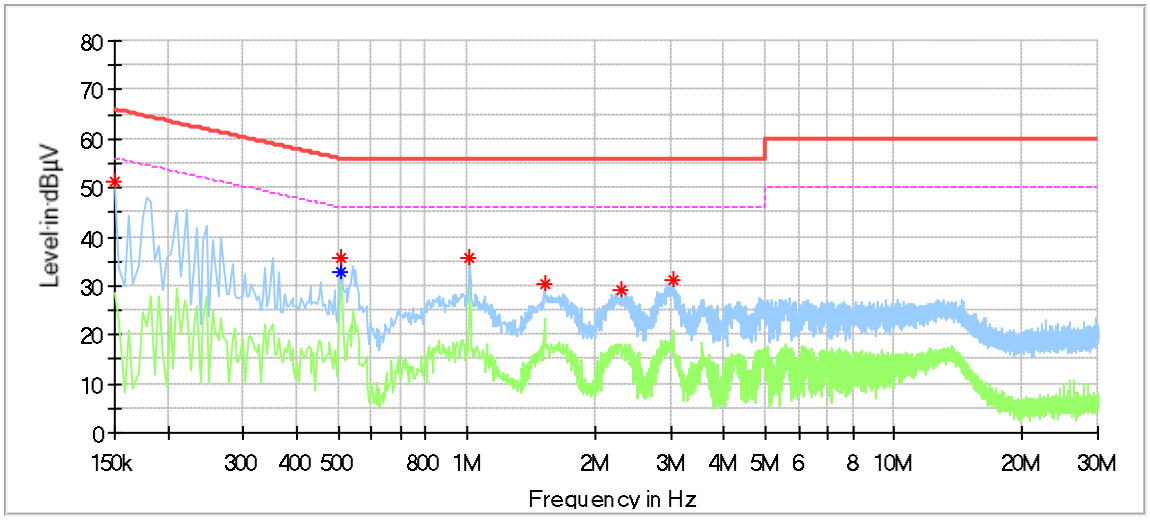
Conducted Emission

Product Type	:	The Remote
M/N	:	RMRU3
Operating Condition	:	Charging + Transmit
Test Specification	:	Power Line, Neutral
Comment	:	AC 120V/60Hz (External adapter)



Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.150000	51.23	---	66.00	14.77	N	9.6
0.510000	35.55	---	56.00	20.45	N	9.6
0.510000	---	32.71	46.00	13.29	N	9.6
1.014000	35.83	---	56.00	20.17	N	9.6
1.522000	30.45	---	56.00	25.55	N	9.6
2.302000	28.98	---	56.00	27.02	N	9.6
3.046000	31.38	---	56.00	24.62	N	9.6

Remark：
Level=Reading Level + Correction Factor
Correction Factor=Cable Loss + LISN Factor
(The Reading Level is recorded by software which is not shown in the sheet)

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9.2 Conducted output power

Test Method

1. The EUT was placed on 0.8m height table, the RF output of EUT was connected to the power meter by RF cable. The path loss was compensated to the results for each measurement.
2. Setting the highest output power level of the EUT
3. Record the power value.

Limits

According to §15.247 (b) (3) & RSS-247 5.4(d), conducted output power limit as below:

Frequency Range MHz	Limit W	Limit dBm
2400-2483.5	≤1	≤30

According to & RSS-247 5.4(d), EIRP limit as below:

Frequency Range MHz	Limit W	Limit dBm
2400-2483.5	≤4	≤36.2

Test result as below table

Data rate	Frequency (MHz)	Conducted Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Result
1 Mbps	Low channel 2402MHz	5.60	0.64	6.24	Pass
	Middle channel 2440MHz	5.50	0.64	6.14	Pass
	High channel 2480MHz	5.40	0.64	6.04	Pass
2 Mbps	Low channel 2402MHz	5.50	0.64	6.14	Pass
	Middle channel 2440MHz	5.50	0.64	6.14	Pass
	High channel 2480MHz	5.30	0.64	5.94	Pass

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9.3 6dB bandwidth

Test Method

1. Connect EUT test port to spectrum analyzer.
2. Use the following spectrum analyzer settings:
   RBW=100K, VBW≥3RBW, Sweep = auto, Detector function = peak, Trace = max hold
3. Use the automatic bandwidth measurement capability of an instrument, may be employed using the X dB bandwidth mode with X set to 6 dB, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥ 6 dB.
4. Allow the trace to stabilize, record the X dB Bandwidth value.

Limit

Limit [kHz]
≥500

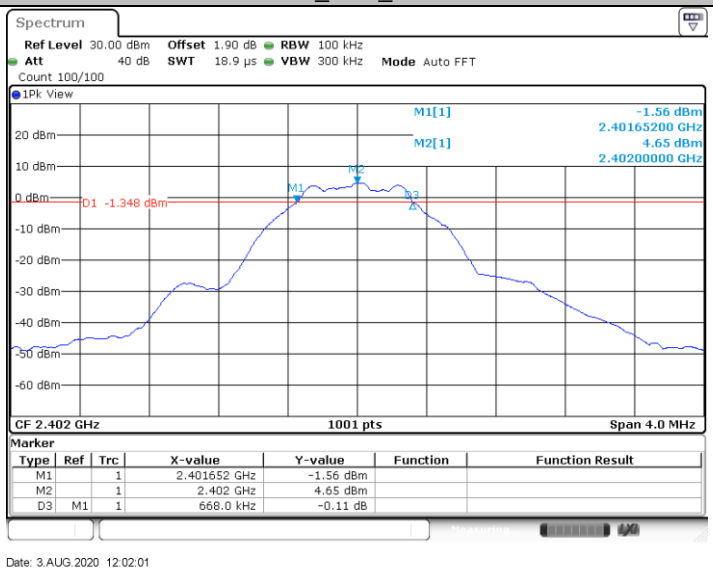
Test result

Data rate	Channel (MHz)	Result (MHz)	Limit (KHz)	Verdict
1 Mbps	2402	0.668	≥500	PASS
	2440	0.664	≥500	PASS
	2480	0.660	≥500	PASS
2 Mbps	2402	1.124	≥500	PASS
	2440	1.124	≥500	PASS
	2480	1.124	≥500	PASS

Test Graphs

1 Mbps:

BLE_Ant1_2402



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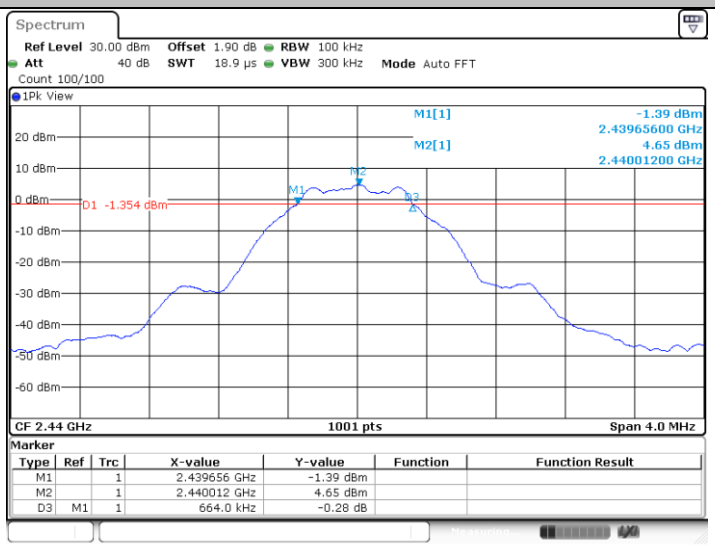

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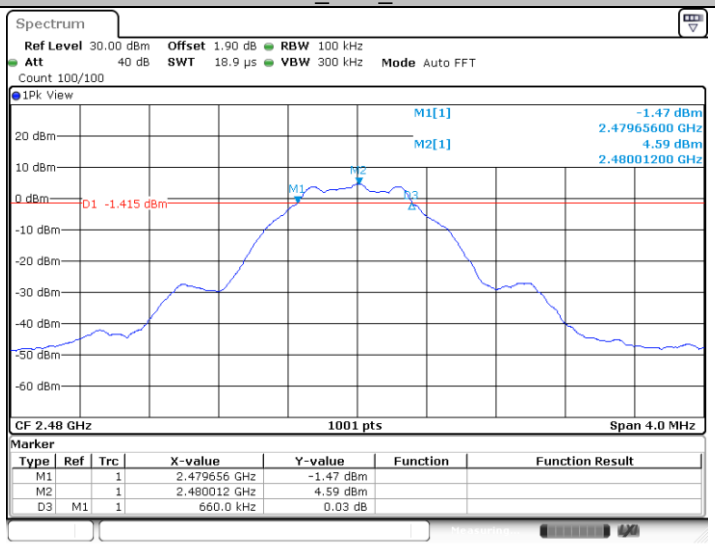

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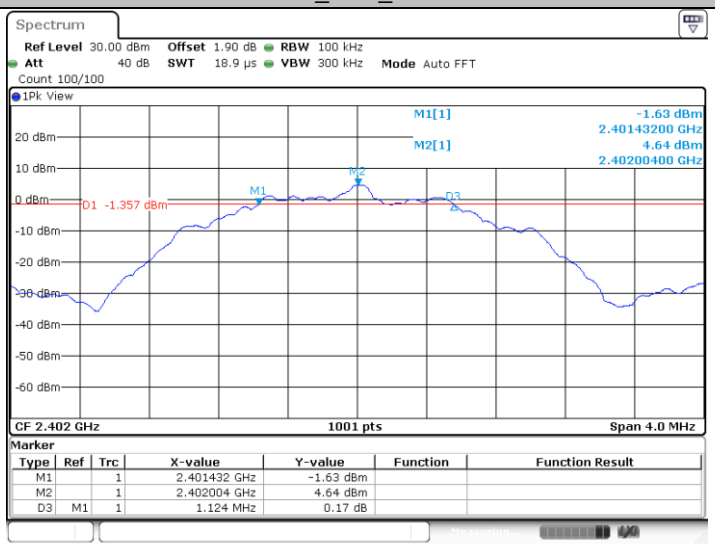
2 Mbps:

BLE_Ant1_2402



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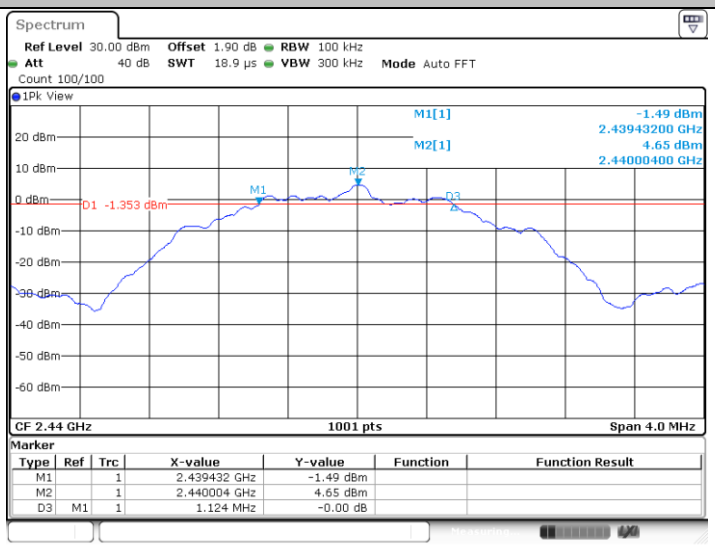

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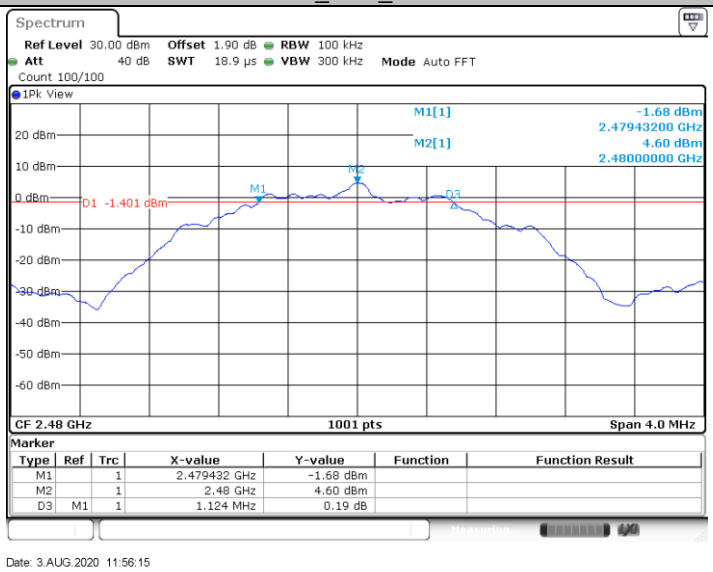
BLE_Ant1_2480



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9.4 99% bandwidth

Test Method

1. Connect EUT test port to spectrum analyzer.
2. Use the following spectrum analyzer settings:
RBW=1% to 5% of the actual occupied, VBW≥3RBW, Sweep = auto,
Detector function = peak, Trace = max hold
3. Use the automatic bandwidth measurement capability of an instrument, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥ 6 dB.
4. Allow the trace to stabilize, record the X dB Bandwidth value.

Limit

Limit [kHz]
--

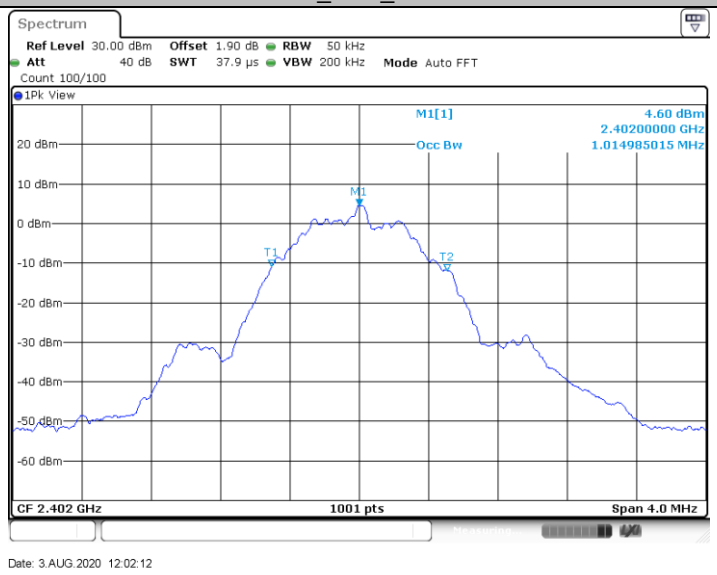
Test result

Data rate	Channel (MHz	Result (MHz)	Limit	Verdict
1 Mbps	2402	1.015	---	PASS
	2440	1.011	---	PASS
	2480	1.011	---	PASS
2 Mbps	2402	2.030	---	PASS
	2440	2.034	---	PASS
	2480	2.034	---	PASS

Test Graphs

1 Mbps:

BLE_Ant1_2402



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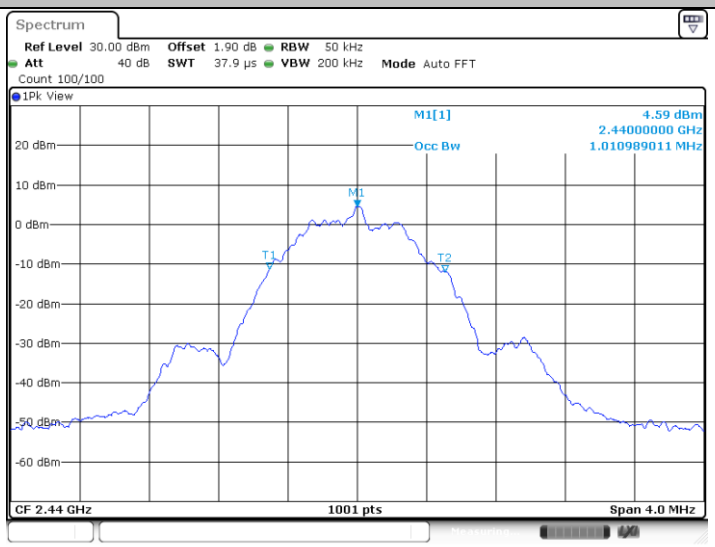
BLE_Ant1_2440
 Date: 3.AUG.2020 12:05:02
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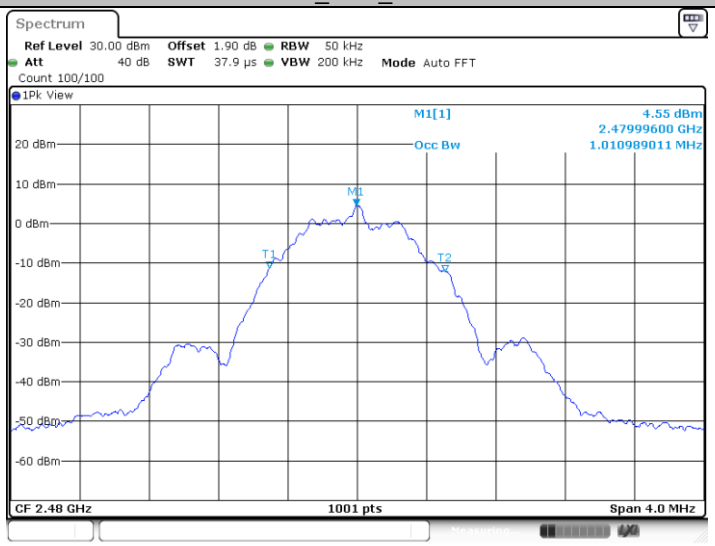 Date: 3.AUG.2020 12:07:05

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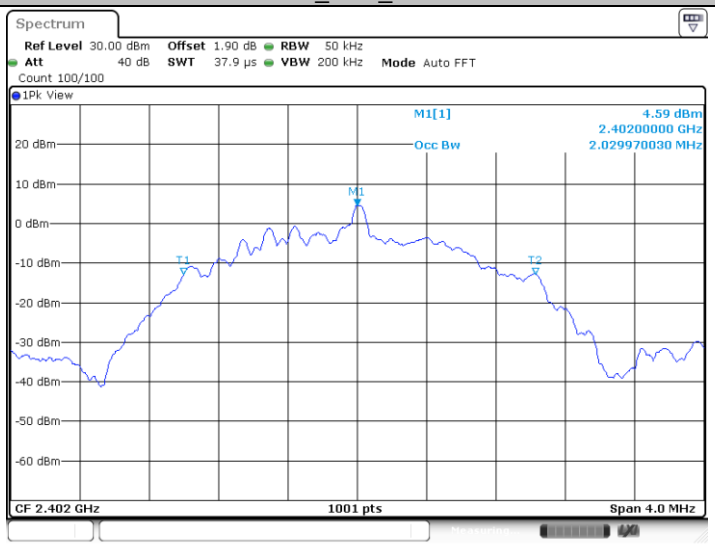
2 Mbps:

BLE_Ant1_2402



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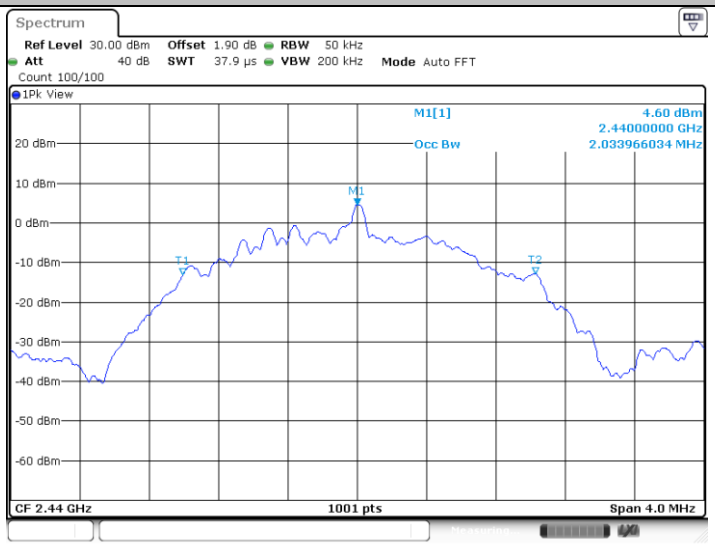

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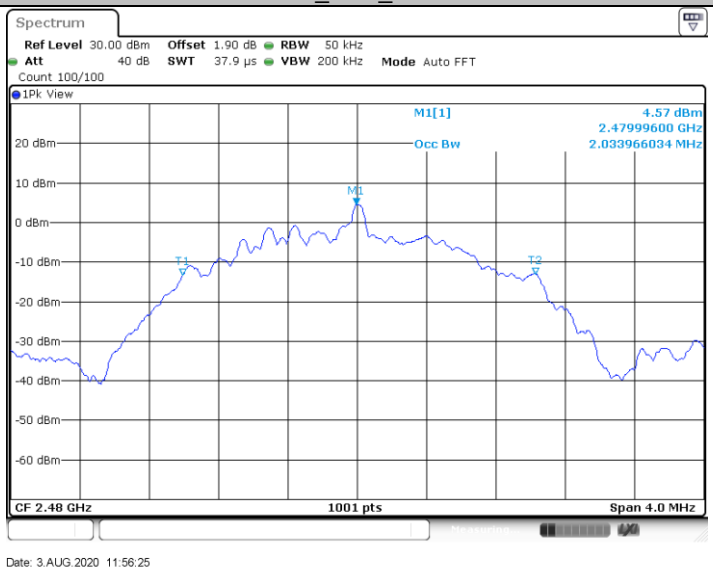
BLE_Ant1_2480


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9.5 Power spectral density

Test Method

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance:

1. The RF output of EUT was connected to the test receiver by RF cable. The path loss was compensated to the results for each measurement.
2. Set analyzer center frequency to DTS channel center frequency. RBW=10kHz, VBW≥3RBW, Span=1.5 times DTS bandwidth, Detector=Peak, Sweep=auto, Trace= max hold.
3. Allow trace to fully stabilize, use the peak marker function to determine the maximum amplitude level within the RBW.
4. Repeat above procedures until other frequencies measured were completed.

Limit

Limit [dBm/3KHz]
≤8

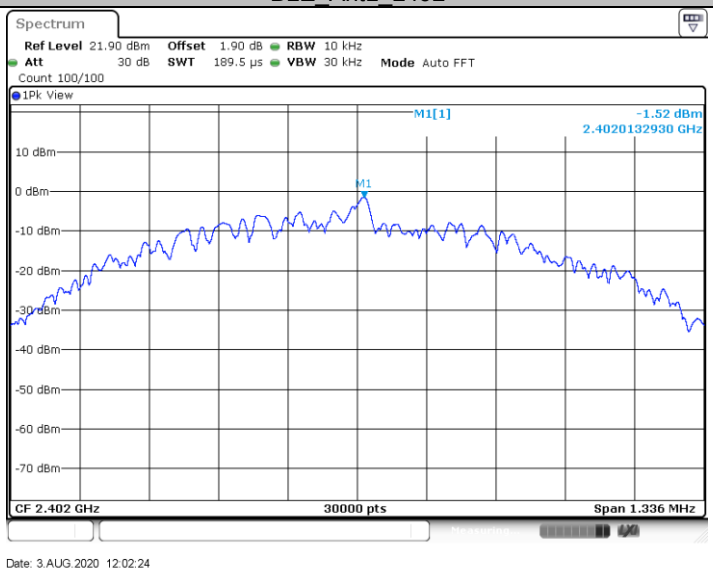
Test result

Data rate	Channel (MHz)	Result (dBm/10KHz)	Limit(dBm/3KHz)	Verdict
1 Mbps	2402	-1.52	8	PASS
	2440	-1.68	8	PASS
	2480	-1.65	8	PASS
2 Mbps	2402	-1.35	8	PASS
	2440	-1.18	8	PASS
	2480	-0.97	8	PASS

Test Graphs

1 Mbps:

BLE_Ant1_2402



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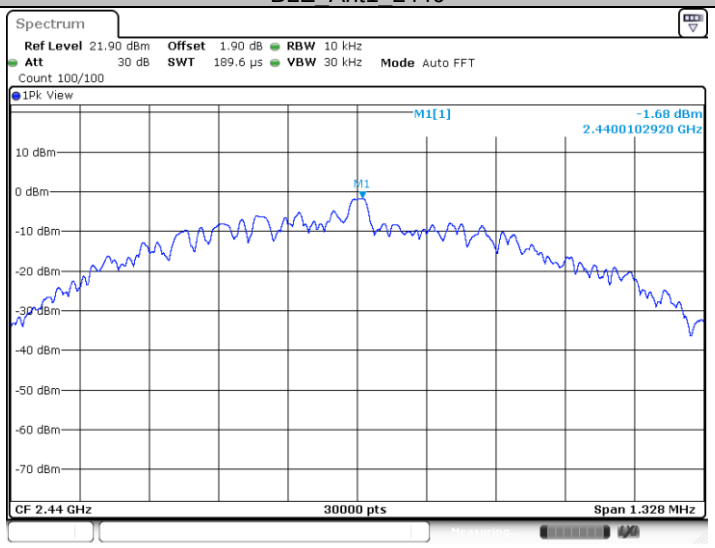
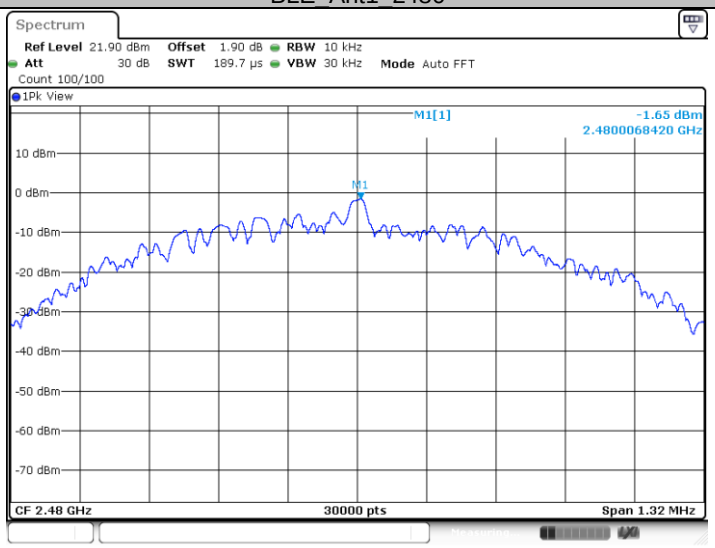
BLE_Ant1_2440

BLE_Ant1_2480


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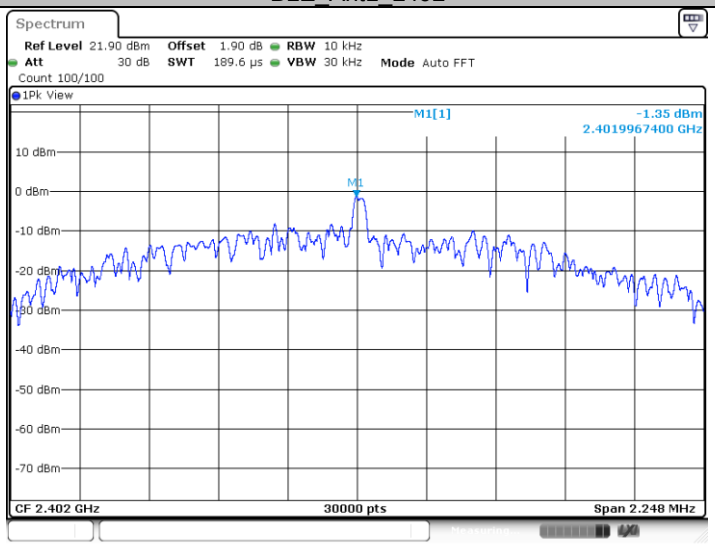
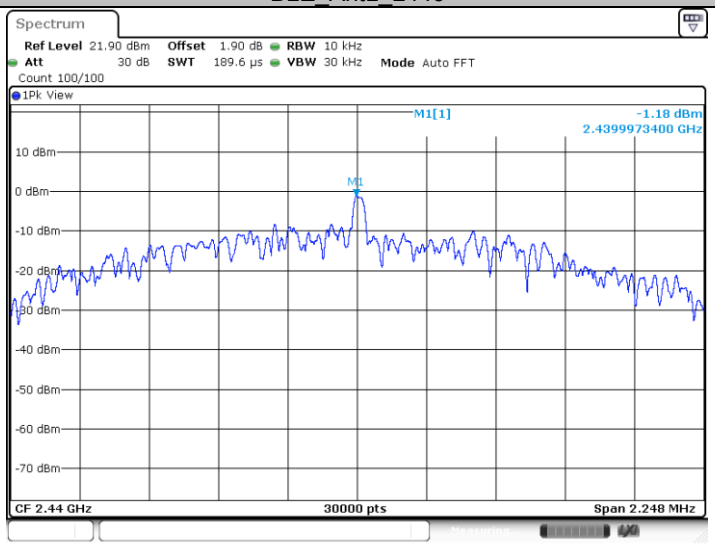
2 Mbps:

BLE_Ant1_2402



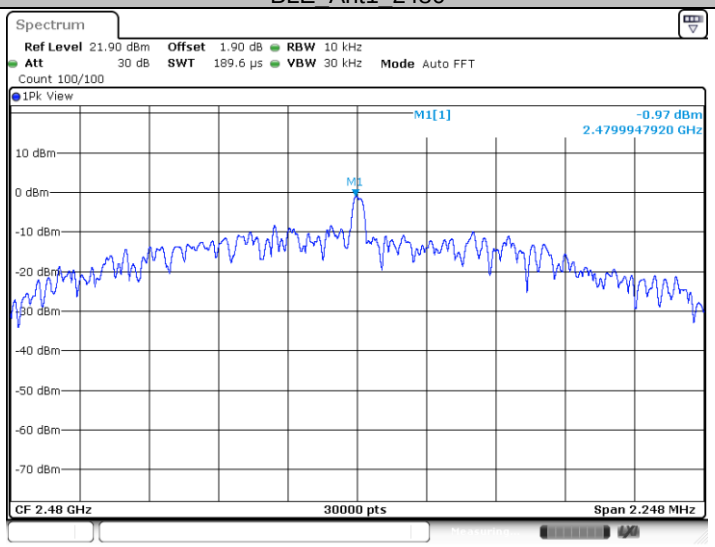
Date: 10.AUG.2020 15:35:34

BLE_Ant1_2440



Date: 10.AUG.2020 15:35:52

BLE_Ant1_2480



Date: 10.AUG.2020 15:36:06

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9.6 Spurious RF conducted emissions

Test Method

1. The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.
2. Use the following spectrum analyzer settings:
   Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.
   RBW = 100 kHz, VBW≥RBW, Sweep = auto, Detector function = peak, Trace = max hold
3. Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded.
4. The level displayed must comply with the limit specified in this Section. Submit these plots.
5. Repeat above procedures until all frequencies measured were complete.

Limit

Frequency Range MHz	Limit (dBc)
30-25000	-20

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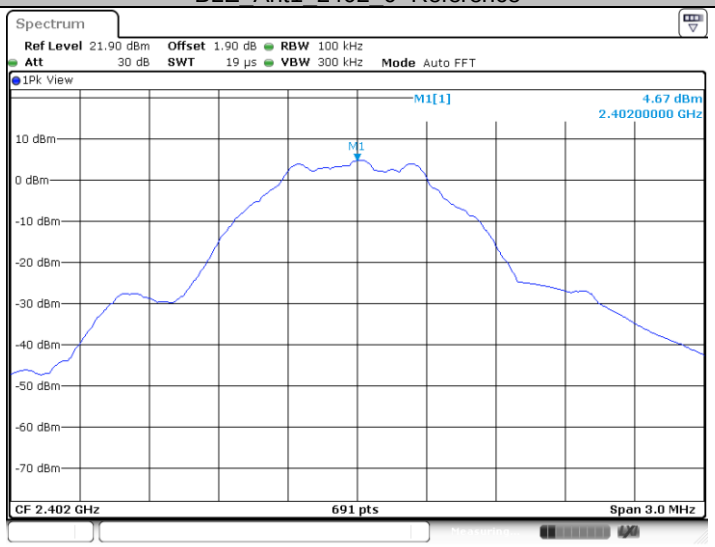
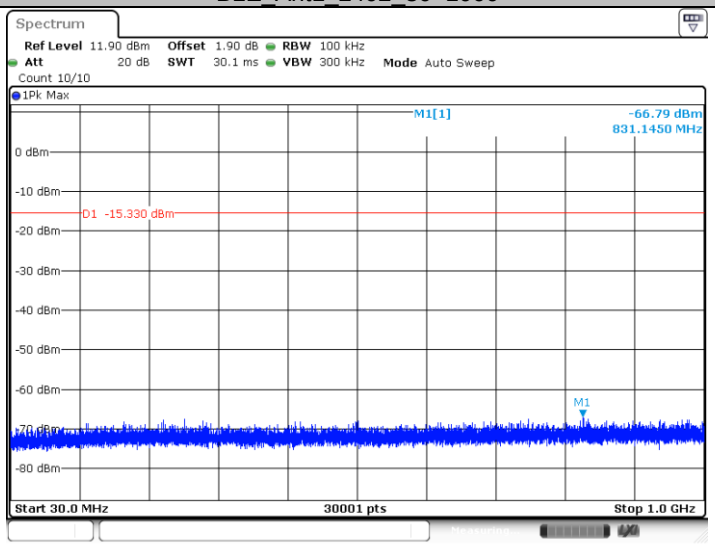
Test Result
Remark: The emissions exceed limit is fundamental signal.

1 Mbps:

BLE_Ant1_2402_0~Reference



BLE_Ant1_2402_30~1000



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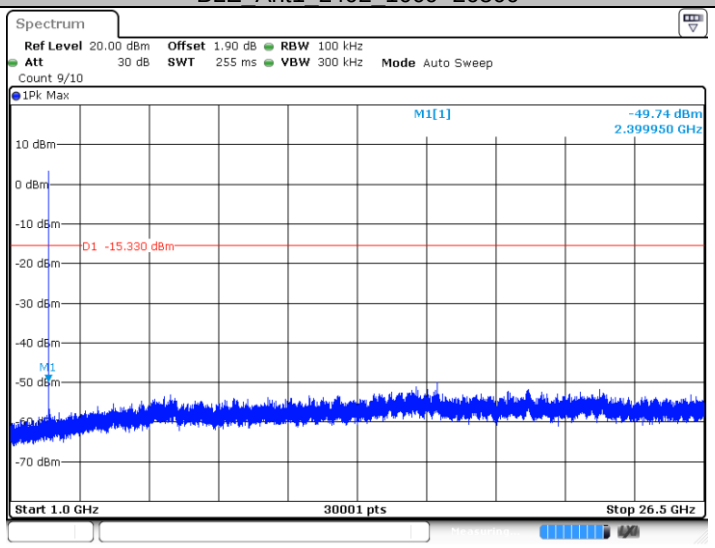
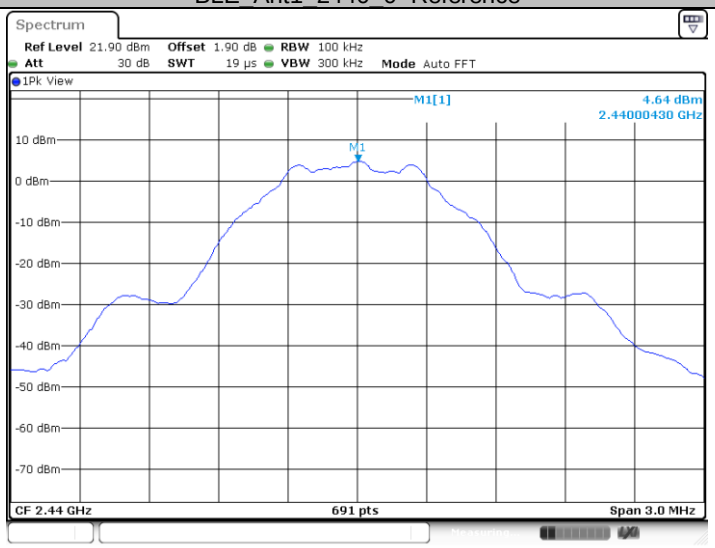
BLE_Ant1_2402_1000~26500



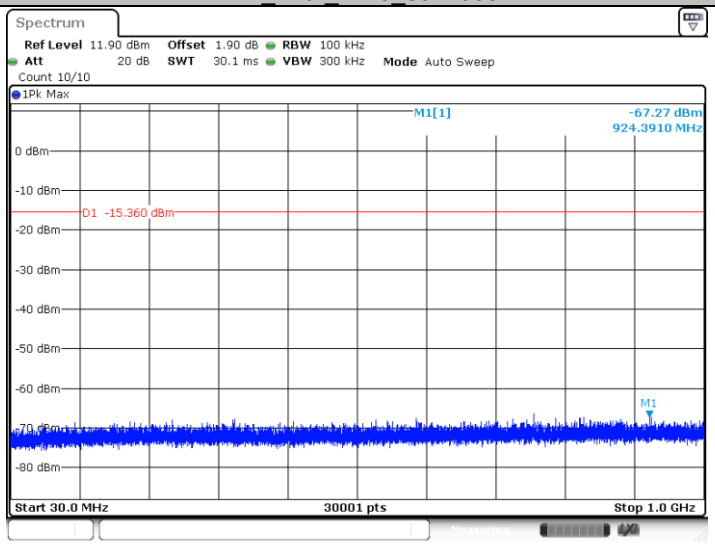
Date: 3.AUG.2020 12:02:53

BLE_Ant1_2440_0~Reference



Date: 3.AUG.2020 12:05:20

BLE_Ant1_2440_30~1000



Date: 3.AUG.2020 12:05:26

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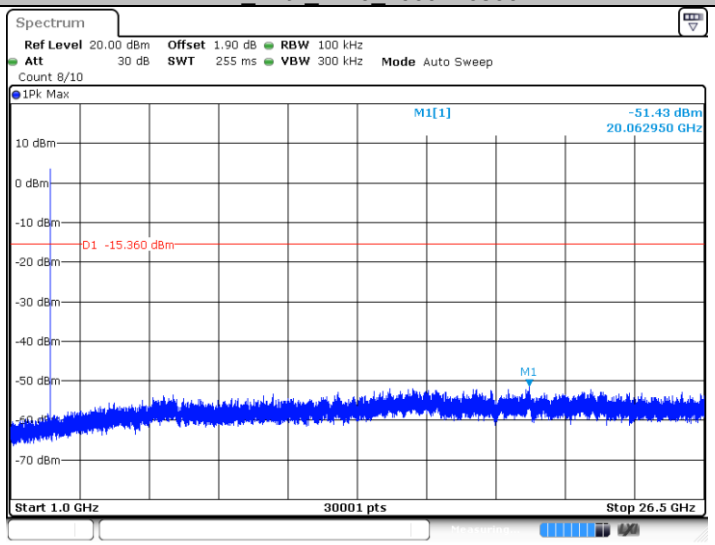
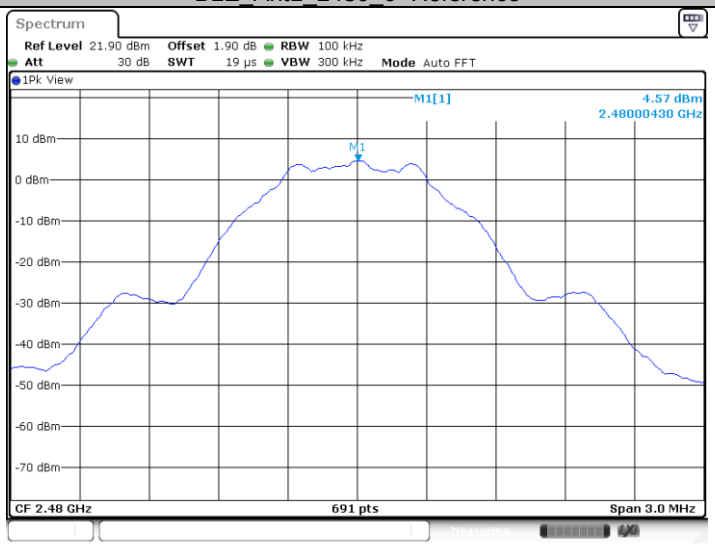
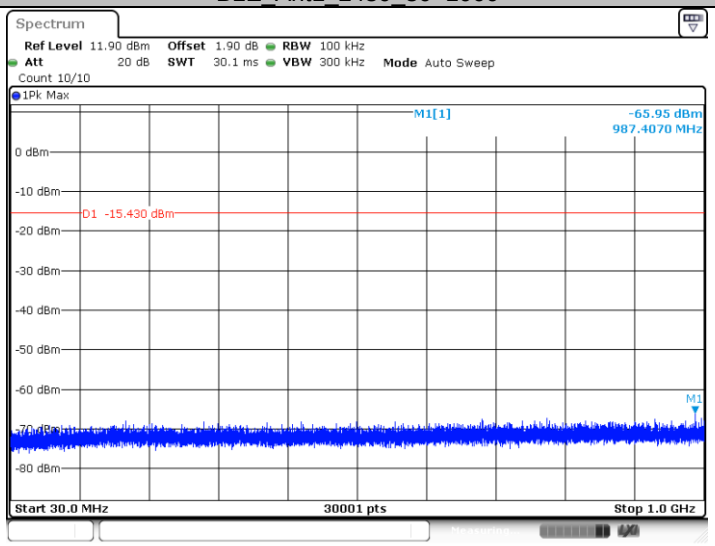
BLE_Ant1_2440_1000~26500



BLE_Ant1_2480_0~Reference



BLE_Ant1_2480_30~1000



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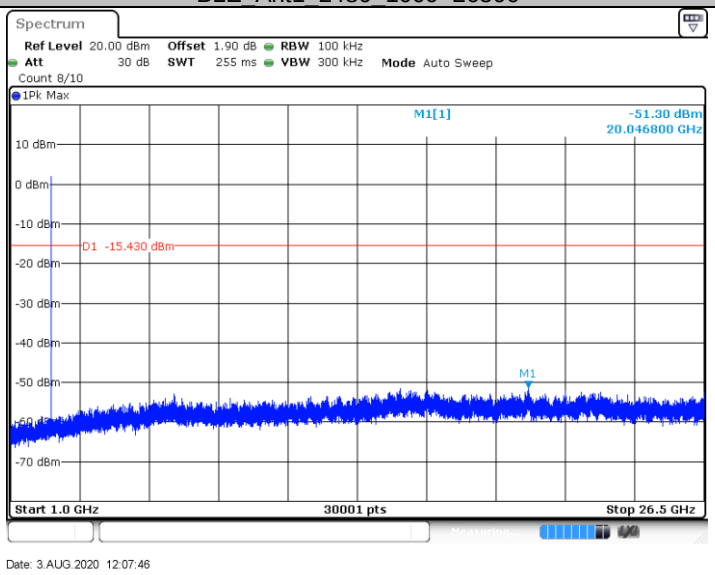
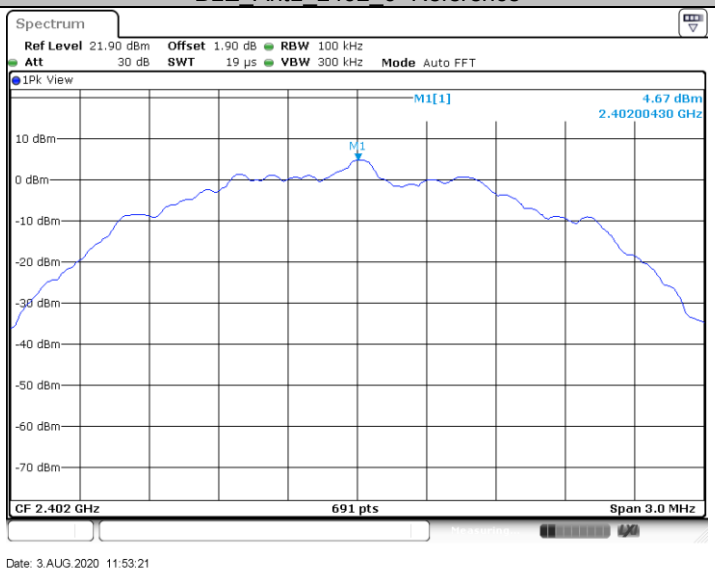
BLE_Ant1_2480_1000~26500


2 Mbps:

BLE_Ant1_2402_0~Reference


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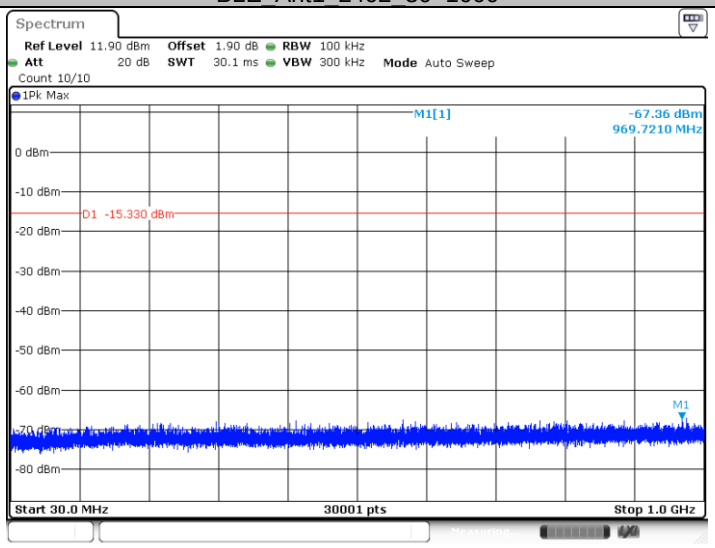
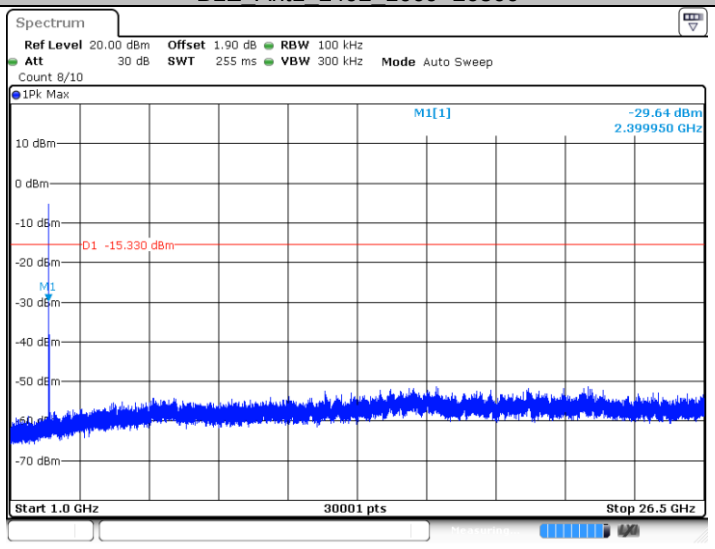
BLE_Ant1_2402_30~1000



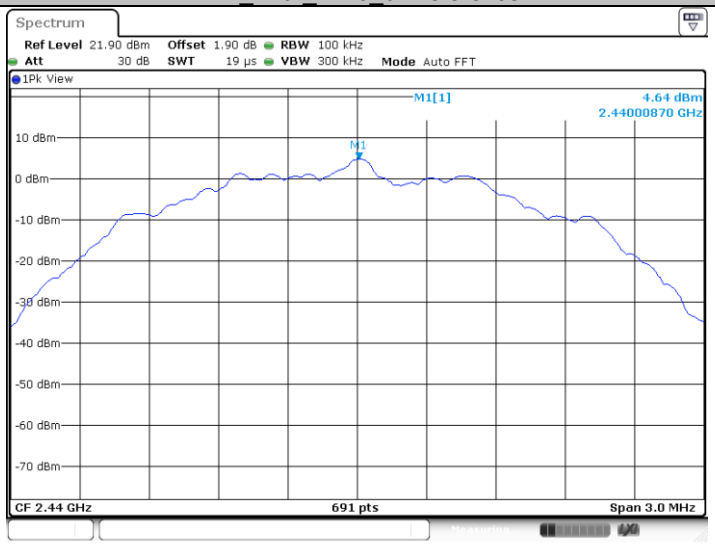
Date: 3.AUG.2020 11:53:28

BLE_Ant1_2402_1000~26500



Date: 3.AUG.2020 11:53:35

BLE_Ant1_2440_0~Reference



Date: 3.AUG.2020 11:55:04

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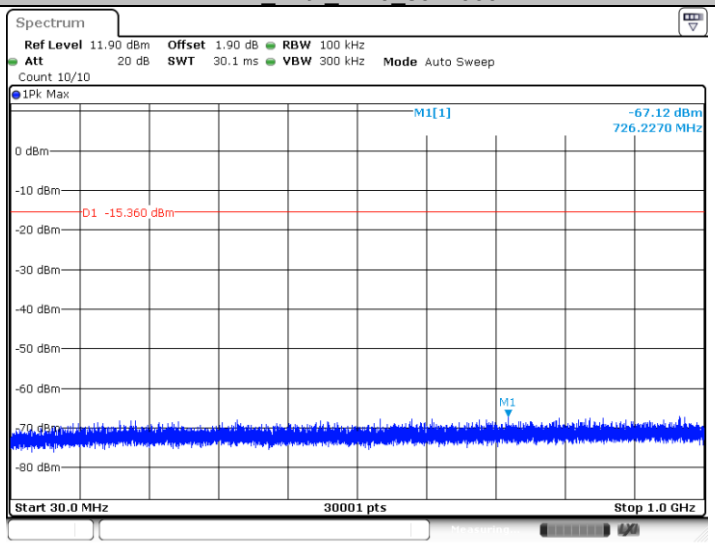
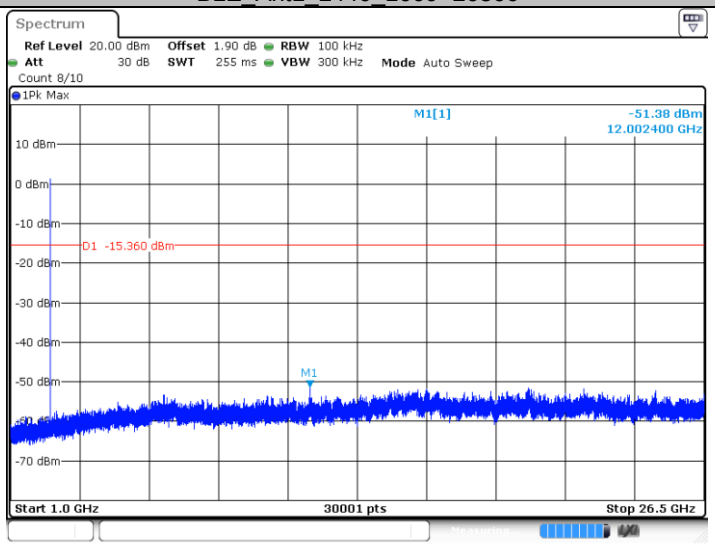
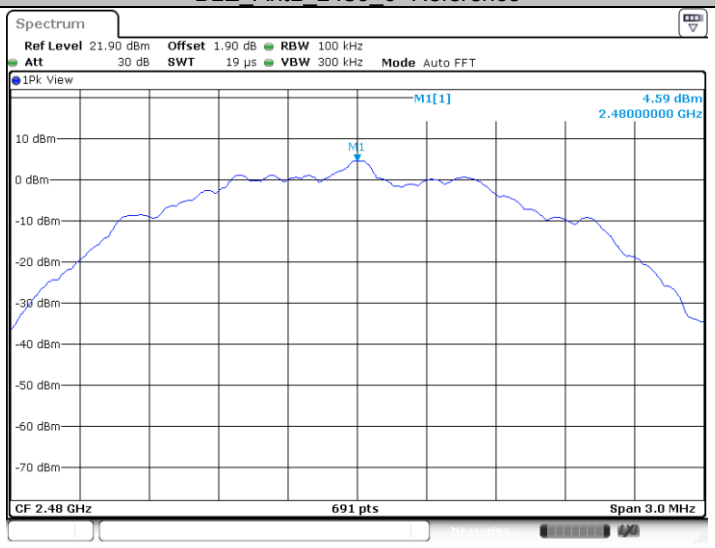
BLE_Ant1_2440_30~1000



BLE_Ant1_2440_1000~26500



BLE_Ant1_2480_0~Reference



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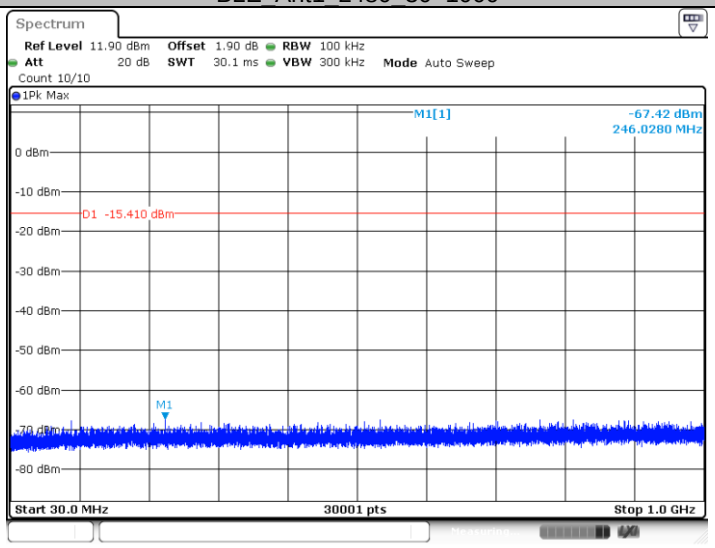
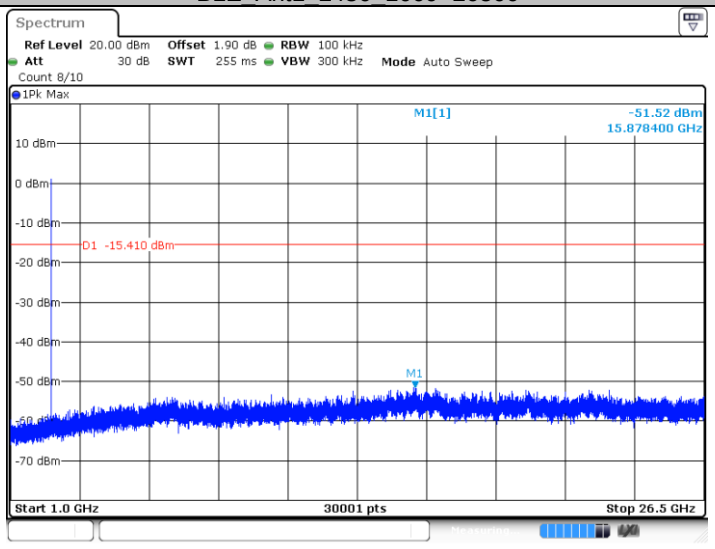
BLE_Ant1_2480_30~1000



BLE_Ant1_2480_1000~26500



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9.7 Band edge

Test Method

1. The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.
2. Use the following spectrum analyzer settings:
   Span = wide enough to capture the peak level of the in-band emission and all spurious
   RBW = 100 kHz, VBW≥RBW, Sweep = auto, Detector function = peak, Trace = max hold
3. Allow the trace to stabilize, use the peak and delta measurement to record the result.
4. The level displayed must comply with the limit specified in this Section.
5. Repeat the test at the hopping off and hopping on mode, submit all the plots.

Limit:

According to §15.247(d) and RSS-247 5.5, in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a) and RSS-Gen 8.10, must also comply with the radiated emission limits specified in 15.209(a) (see Section 15.205(c)) and RSS-Gen.

Frequency Range MHz	Limit (dBc)
30-25000	-20

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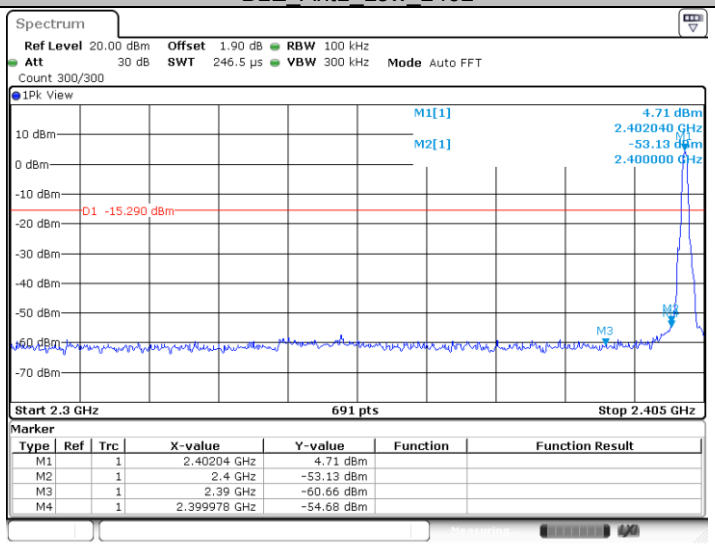
Test result

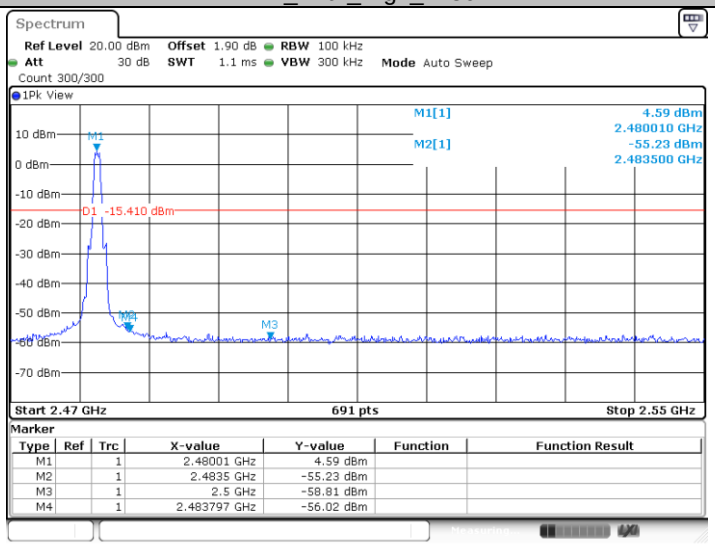
1 Mbps:

BLE_Ant1_Low_2402



Date: 3.AUG.2020 12:02:33

BLE_Ant1_High_2480



Date: 3.AUG.2020 12:07:26

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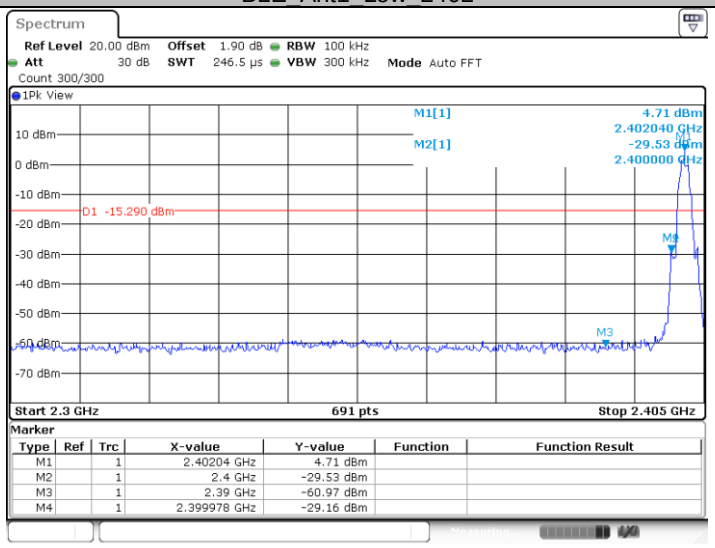
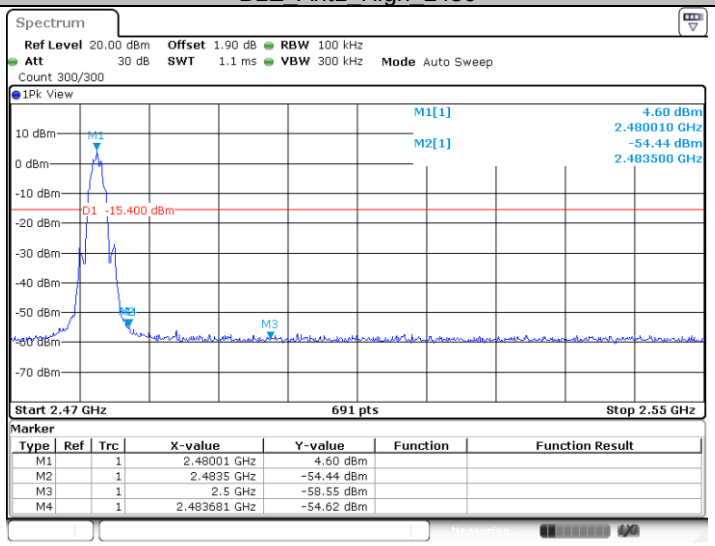
2 Mbps:

BLE_Ant1_Low_2402



BLE_Ant1_High_2480



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9.8 Spurious radiated emissions for transmitter

Test Method

1: The EUT was place on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
2: The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.
3: The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4: For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
5: Use the following spectrum analyzer settings According to C63.10:
For Below 1GHz
Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious RBW = 100 KHz to 120KHz, VBW≥RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

For Peak unwanted emissions Above 1GHz:

Span = wide enough to capture the peak level of the in-band emission and all spurious RBW = 1MHz, VBW≥RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.
Procedures for average unwanted emissions measurements above 1000 MHz
a) RBW = 1MHz.
b) VBW \ [3 × RBW].
c) Detector = RMS (power averaging), if [span / (# of points in sweep)] \ RBW / 2. Satisfying this condition can require increasing the number of points in the sweep or reducing the span. If the condition is not satisfied, then the detector mode shall be set to peak.
d) Averaging type = power (i.e., rms) (As an alternative, the detector and averaging type may be set for linear voltage averaging. Some instruments require linear display mode to use linear voltage averaging. Log or dB averaging shall not be used.)
e) Sweep time = auto.
f) Perform a trace average of at least 100 traces if the transmission is continuous. If the transmission is not continuous, then the number of traces shall be increased by a factor of 1 / D, where D is the duty cycle. For example, with 50% duty cycle, at least 200 traces shall be averaged. (If a specific emission is demonstrated to be continuous—i.e., 100% duty cycle—then rather than turning ON and OFF with the transmit cycle, at least 100 traces shall be averaged.)
g) If tests are performed with the EUT transmitting at a duty cycle less than 98%, then a correction factor shall be added to the measurement results prior to comparing with the emission limit, to compute the emission level that would have been measured had the test been performed at 100% duty cycle. The correction factor is computed as follows:
1) If power averaging (rms) mode was used in the preceding step e), then the correction factor is [10 log (1 / D)], where D is the duty cycle. For example, if the transmit duty

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cycle was 50%, then 3 dB shall be added to the measured emission levels.
2) If linear voltage averaging mode was used in the preceding step e), then the correction factor is [20 log (1 / D)], where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 6 dB shall be added to the measured emission levels.
3) If a specific emission is demonstrated to be continuous (100% duty cycle) rather than turning ON and OFF with the transmit cycle, then no duty cycle correction is required for that emission.

Limit

The radio emission outside the operating frequency band shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. Radiated emissions which fall in the restricted bands, as defined in section15.205 and RSS-GEN 8.10, must comply with the radiated emission limits specified in section 15.209.

Frequency MHz	Field Strength uV/m	Field Strength dBµV/m	Detector
30-88	100	40	QP
88-216	150	43.5	QP
216-960	200	46	QP
960-1000	500	54	QP
Above 1000	500	54	AV
Above 1000	5000	74	PK

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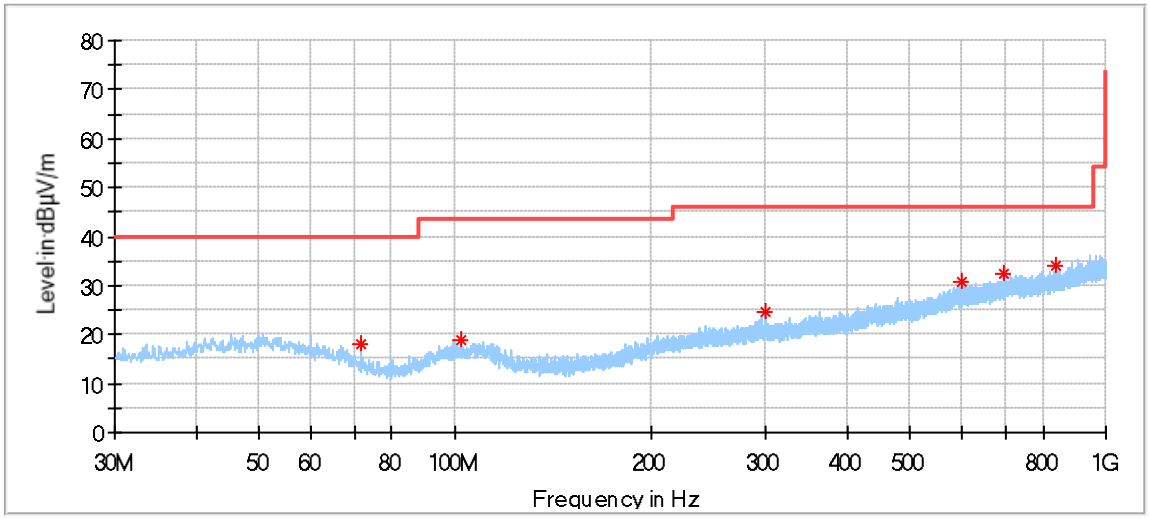
Spurious radiated emissions for transmitter

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

The only worse case (1 Mbps) test result is listed in the report.

Transmitting spurious emission test result as below:

Below 1G:



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
71.710000	18.23	40.00	21.77	100.0	H	289.0	9.8
102.211111	18.89	43.50	24.61	100.0	H	356.0	12.3
300.145000	24.49	46.00	21.51	100.0	H	289.0	15.3
599.928889	30.60	46.00	15.40	100.0	H	310.0	21.3
697.575556	32.34	46.00	13.66	100.0	H	229.0	22.9
836.447222	34.00	46.00	12.00	100.0	H	38.0	24.6

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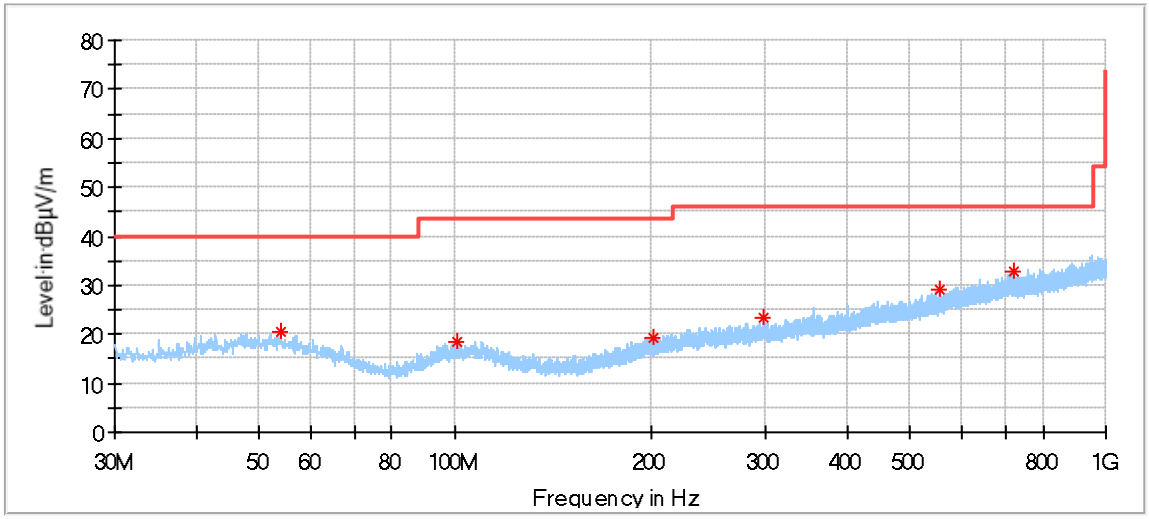

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
53.872778	20.69	40.00	19.31	100.0	V	4.0	14.3
100.756111	18.40	43.50	25.10	100.0	V	222.0	12.2
201.743889	19.48	43.50	24.02	100.0	V	352.0	12.2
296.857778	23.45	46.00	22.55	100.0	V	275.0	15.3
557.356667	29.27	46.00	16.73	100.0	V	29.0	20.4
722.418333	32.84	46.00	13.16	100.0	V	284.0	23.2

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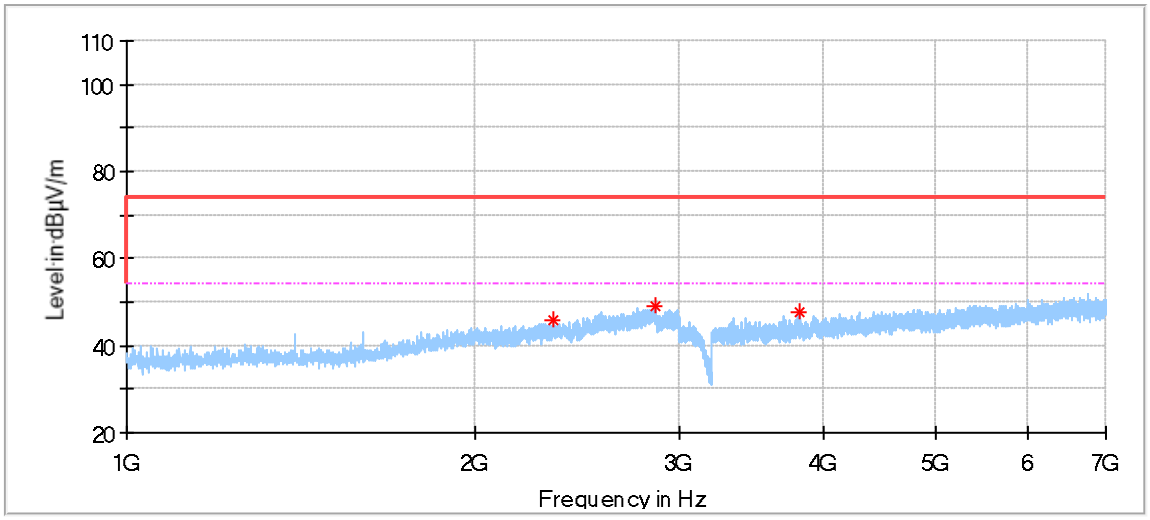
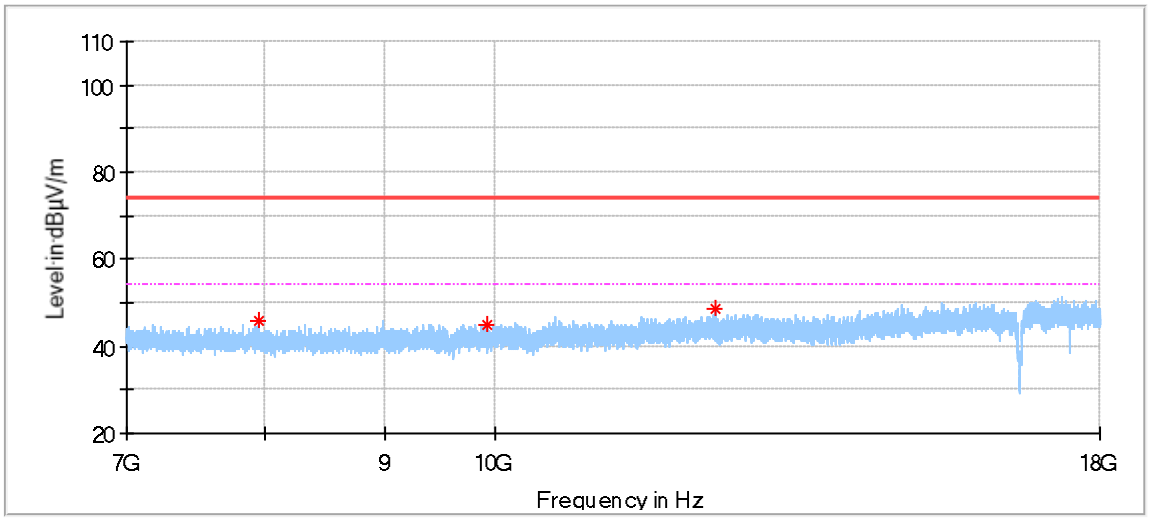
Low channel 2402MHz



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2338.000000*	45.66	74.00	28.34	150.0	H	44.0	-3.3
2856.500000*	49.20	74.00	24.80	150.0	H	108.0	-0.9
3814.500000*	47.61	74.00	26.39	150.0	H	225.0	0.2



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
7950.500000	45.65	74.00	28.35	150.0	H	322.0	6.7
9927.000000	44.77	74.00	29.23	150.0	H	70.0	7.8
12401.500000*	48.39	74.00	25.61	150.0	H	93.0	10.2

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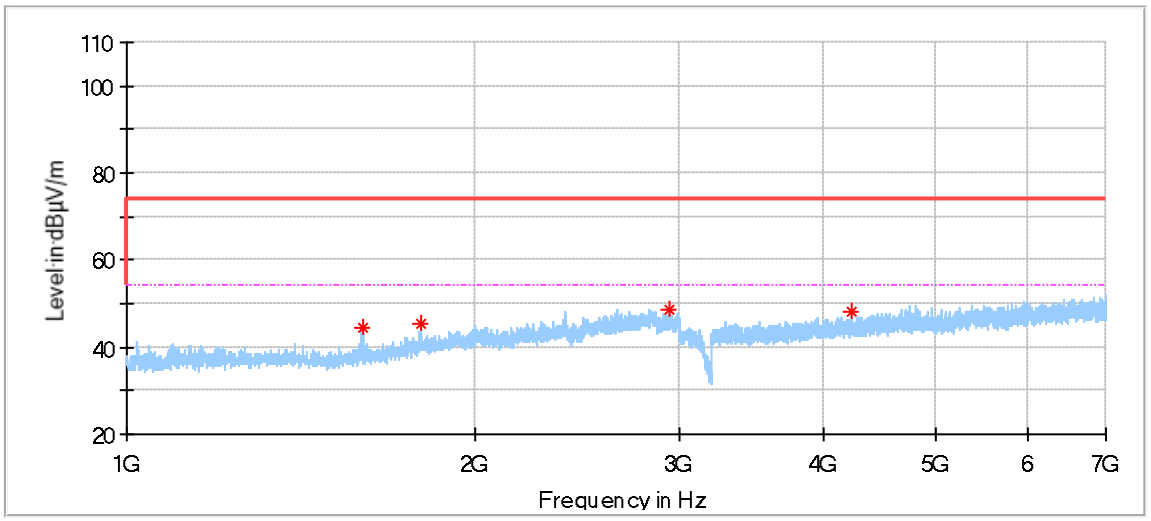
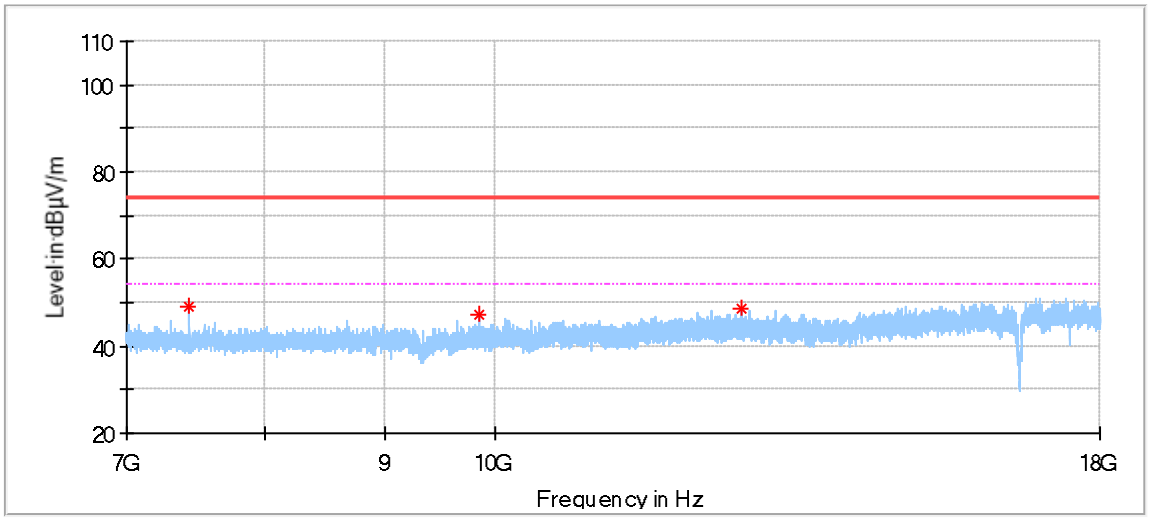


Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1600.500000*	44.53	74.00	29.47	150.0	V	270.0	-8.2
1792.500000	45.49	74.00	28.51	150.0	V	287.0	-5.7
2944.500000	48.49	74.00	25.51	150.0	V	108.0	-0.6
4223.500000*	48.06	74.00	25.94	150.0	V	138.0	2.2



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
7440.500000*	48.88	74.00	25.12	150.0	V	116.0	5.9
9849.500000	47.29	74.00	26.71	150.0	V	70.0	7.8
12716.000000	48.80	74.00	25.20	150.0	V	231.0	10.3

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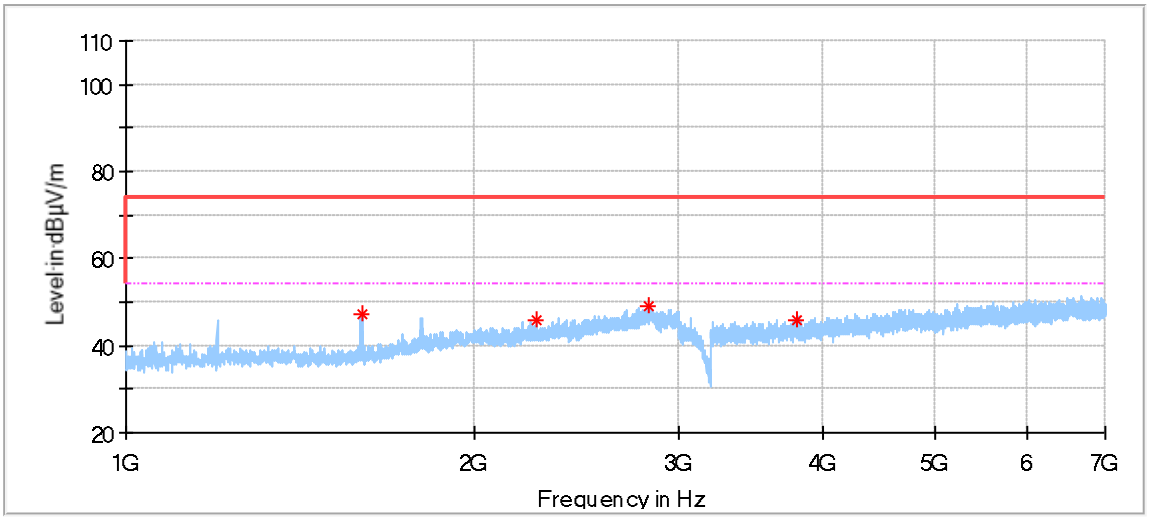
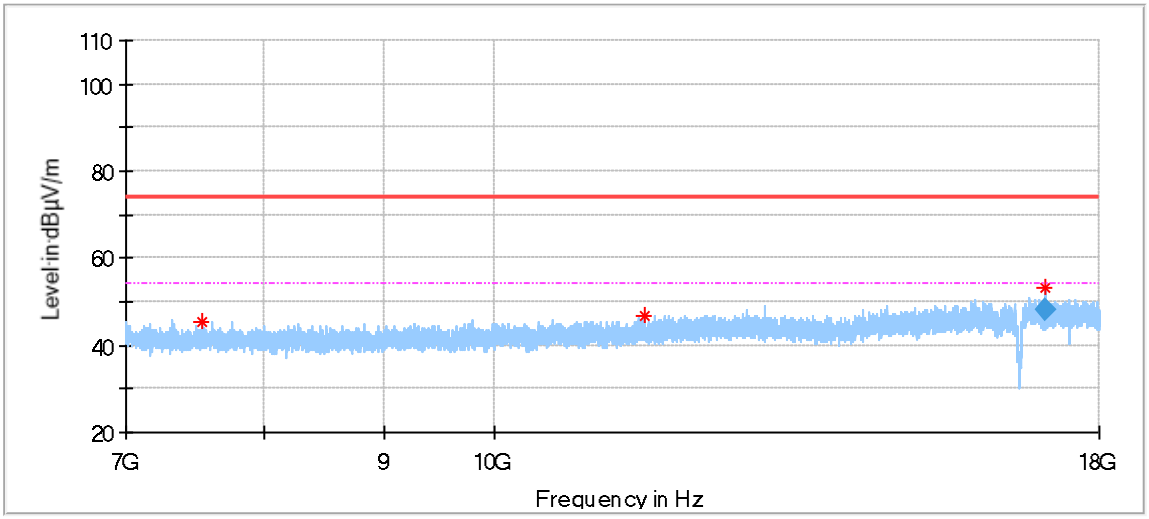
Middle channel 2440MHz



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1598.500000	47.12	74.00	26.88	150.0	H	55.0	-8.2
2263.500000*	46.01	74.00	27.99	150.0	H	45.0	-3.9
2822.500000*	48.87	74.00	25.13	150.0	H	137.0	-0.8
3795.000000*	45.81	74.00	28.19	150.0	H	254.0	0.2



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
7539.000000*	45.44	74.00	28.56	150.0	H	57.0	6.7
11576.500000*	46.83	74.00	27.17	150.0	H	57.0	8.8
17078.500000	53.12	74.00	20.88	150.0	H	218.0	16.7
Frequency (MHz)	**Average (dBµV/m)**	**Limit (dBµV/m)**	**Margin (dB)**	**Height (cm)**	**Pol**	**Azimuth (deg)**	**Corr. (dB/m)**
17078.500000	47.98	54.00	6.01	150.0	H	218.0	16.7

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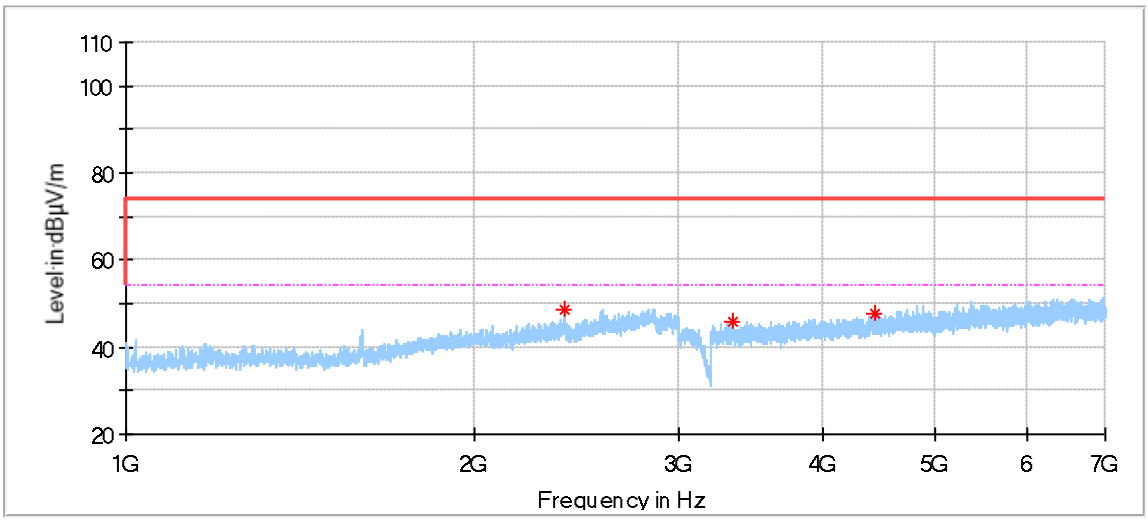
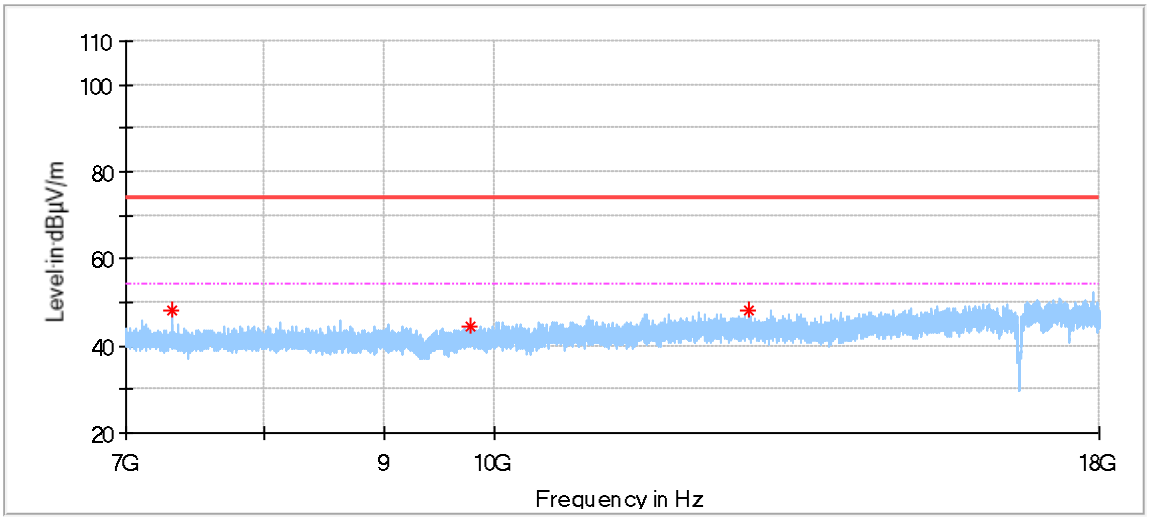


Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2390.500000	48.44	74.00	25.56	150.0	V	314.0	-3.2
3336.500000*	45.81	74.00	28.19	150.0	V	74.0	-1.2
4424.500000	47.91	74.00	26.09	150.0	V	93.0	2.9



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
7320.500000*	48.01	74.00	25.99	150.0	V	106.0	6.5
9777.500000	44.61	74.00	29.39	150.0	V	290.0	7.7
12801.500000	48.27	74.00	25.73	150.0	V	57.0	10.2

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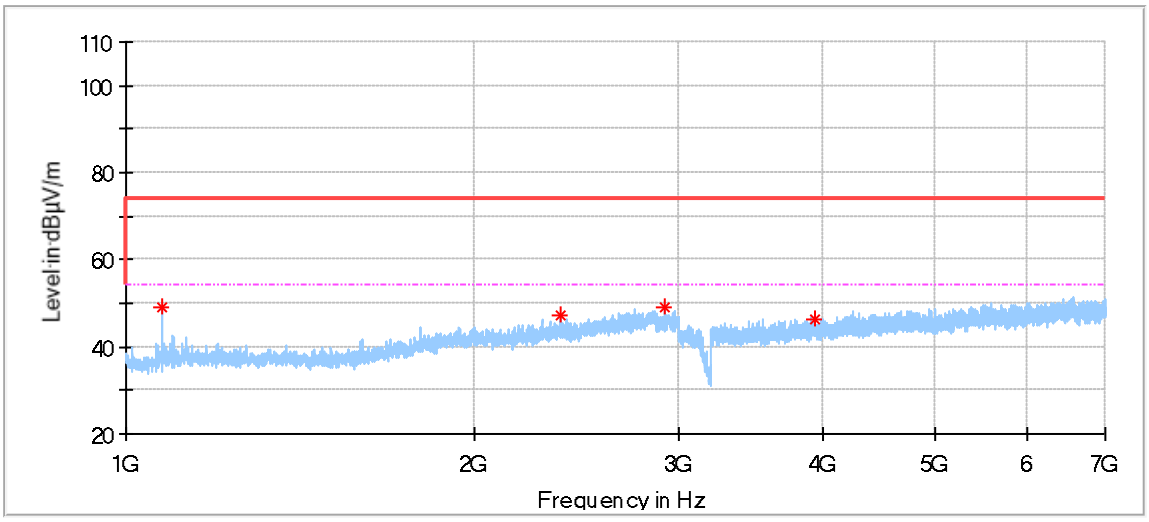
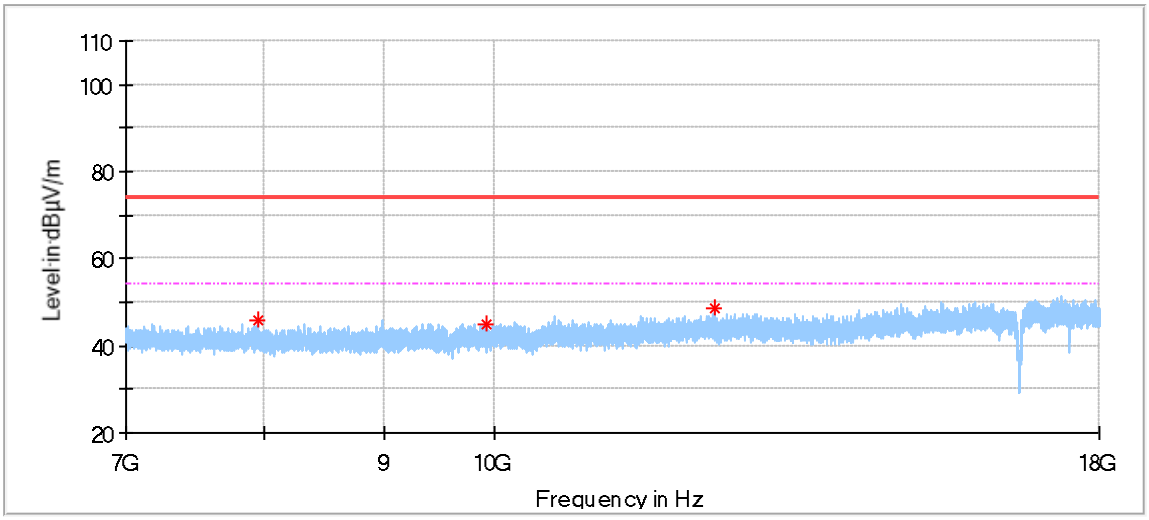
High channel 2480MHz



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1075.000000*	48.86	74.00	25.14	150.0	H	310.0	-10.4
2369.000000*	47.28	74.00	26.72	150.0	H	39.0	-3.3
2911.500000	49.07	74.00	24.93	150.0	H	315.0	-0.7
3930.500000*	46.14	74.00	27.86	150.0	H	9.0	1.1



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
7950.500000	45.65	74.00	28.35	150.0	H	322.0	6.7
9927.000000	44.77	74.00	29.23	150.0	H	70.0	7.8
12401.500000*	48.39	74.00	25.61	150.0	H	93.0	10.2

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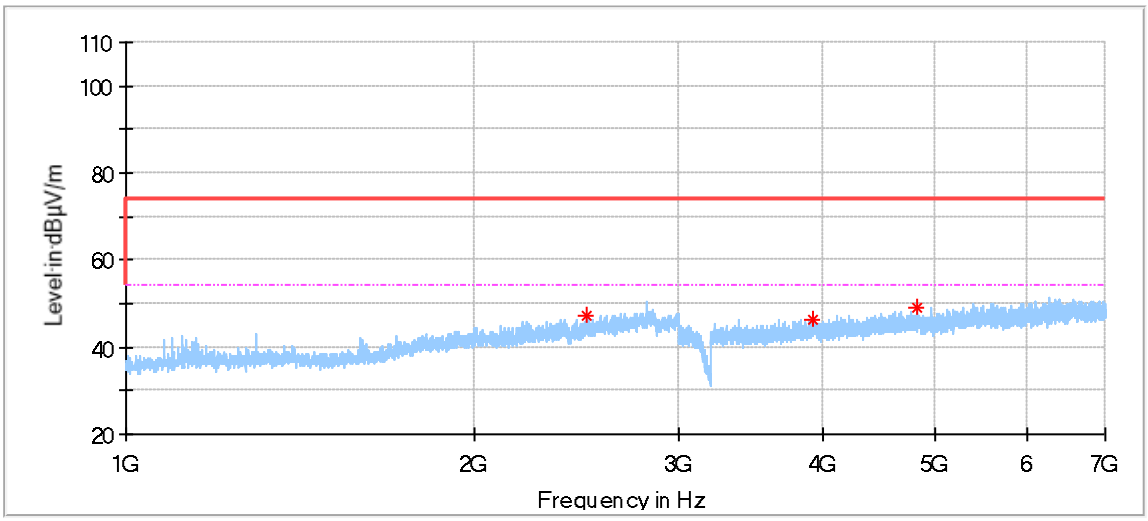
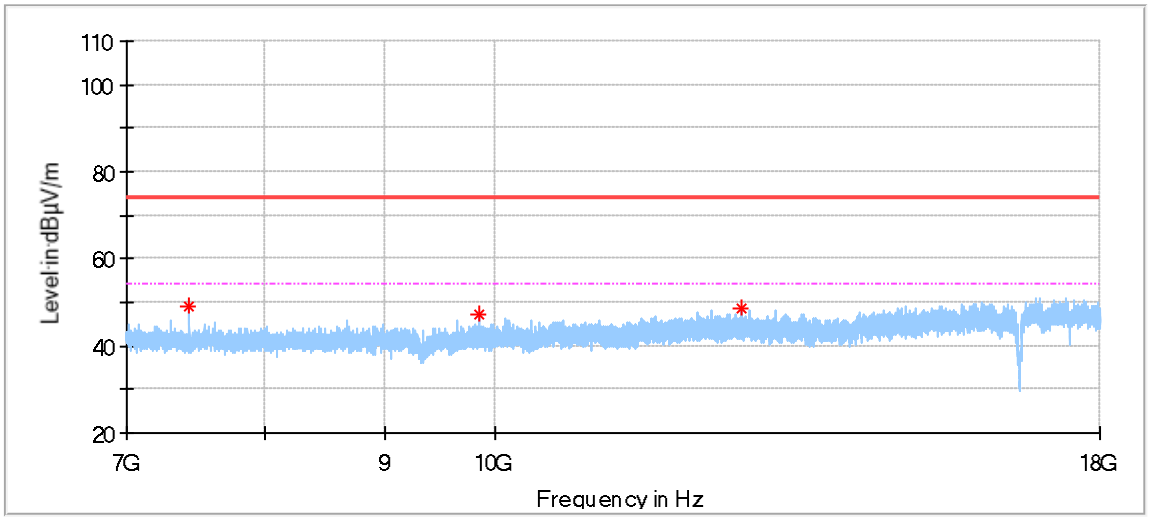


Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Corr. (dB)
2499.500000*	47.20	74.00	26.80	150.0	V	25.0	-2.3	---
3912.500000*	46.39	74.00	27.61	150.0	V	2.0	1.3	---
4821.500000*	49.10	74.00	24.90	150.0	V	241.0	3.1	---



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
7440.500000*	48.88	74.00	25.12	150.0	V	116.0	5.9
9849.500000	47.29	74.00	26.71	150.0	V	70.0	7.8
12716.000000	48.80	74.00	25.20	150.0	V	231.0	10.3

Remark:

(1) Data of measurement within frequency range18-26GHz are the noise floor or attenuated more than 20dB below the permissible limits or the field strength is too small to be measured, so test data does not present in this report,
(2) Data of measurement within this frequency range shown "--" in the table above means the reading of emissions are the noise floor or attenuated more than 10dB below the permissible limits or the field strength is too small to be measured.
(3) Level= Reading Level + Correction Factor
(4) Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain
Below 1GHz: Corrector factor = Antenna Factor + Cable Loss
(The Reading Level is recorded by software which is not shown in the sheet)

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Test Equipment List

Conducted Emission Test

Description	Manufacturer	Model no.	Serial no.	cal. due date
EMI Test Receiver	Rohde & Schwarz	ESR 3	101782	2021-6-29
LISN	Rohde & Schwarz	ENV4200	100249	2021-6-12
Attenuator	Shanghai Huaxiang	TS2-26-3	080928189	2021-6-21
Test software	Rohde & Schwarz	EMC32	Version9.15.00	N/A

Radiated Emission Test

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 26	101269	2021-6-29
High Pass Filter (HPF)	UCL	UCL-BPF1-7G	1504005103	2021-6-28
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	707	2020-8-20
Horn Antenna	Rohde & Schwarz	HF907	102295	2021-6-22
Wideband Horn Antenna	Q-PAR	QWH-SL-18-40-K-SG	12827	2021-7-12
Pre-amplifier	Rohde & Schwarz	SCU 18	102230	2021-6-21
Pre-amplifier	Rohde & Schwarz	SCU 40A	100432	2021-7-16
Attenuator	Agilent	8491A	MY39264334	2021-6-21
3m Semi-anechoic chamber	TDK	9X6X6	----	2022-10-28
Test software	Rohde & Schwarz	EMC32	Version 9.15.00	N/A

RF conducted test

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
Signal Analyzer	Rohde & Schwarz	FSV40	101030	2021-6-21
RF Switch Module	Rohde & Schwarz	OSP120/OSP-B157	101226/100851	2021-6-21
Power Splitter	Weinschel	1580	SC319	2021-7-7
RF Switch Module	Rohde & Schwarz	OSP120/OSP-B157	101226/100851	2021-6-21
Test software	Tonscend	System for BT/WIFI	Version 2.6	N/A

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10 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

System Measurement Uncertainty	
Test Items	Extended Uncertainty
Uncertainty for Conducted Emission 150kHz-30MHz (for test using AMN ENV432 or ENV4200)	3.62dB
Uncertainty for Radiated Spurious Emission 25MHz-3000MHz	Horizontal: 4.81dB; Vertical: 4.89dB;
Uncertainty for Radiated Spurious Emission 3000MHz-18000MHz	Horizontal: 4.69dB; Vertical: 4.68dB;
Uncertainty for Radiated Spurious Emission 18000MHz-40000MHz	Horizontal: 4.89dB; Vertical: 4.87dB;
Uncertainty for Conducted RF test with TS 8997	RF Power Conducted: 1.16dB Frequency test involved: 0.6×10^{-7} or 1%

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